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GLACIATION:

ITS RELATIONS TO THE LACKAWANNA-WYOMING REGION.

A LECTURE DELIVERED BEFORE THE LACKAWANNA INSTITUTE OF HISTORY AND SCIENCE, JULY 3, 1886, WITH NOTES UPON THE GLACIAL STRIÆ.

BY JOHN C. BRANNER, PH.D.

STATE GEOLOGIST OF ARKANSAS, PROFESSOR OF GEOLOGY IN THE UNIVERSITY OF INDIANA.

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PREFATORY NOTE.

The present paper was prepared for the purpose of laying before the members of the Lackawanna Institute the question of glaciation in its relations to the Lackawanna-Wyoming region, with the hope that they might be induced to pursue its study both for its own sake and for the purpose of adding to our knowledge of the subject.

Among the problems presented some are mentioned which are not now regarded as problems among geologists, but they are given for the purpose of stimulating research and encouraging young geologists to seek answers to the questions which must arise in their own minds. The bibliography of the subject will be found in "*Glaciers*," by Shaler and Davis. Maps of the glaciated and non-glaciated areas, by Dr. T. C. Chamberlin, are in the Sixth Annual Report of the U. S. Geological Survey.

GLACIATION:

ITS RELATIONS TO THE LACKAWANNA-WYOMING REGION.

It is now forty-six years since AGASSIZ, young and enthusiastic as he always was, read and interpreted aright the signs of the ancient glaciers. He had spent years studying the Alpine glaciers. He found and announced that the existing are but the remnants of the original ones; that they had once spread out across the whole width of the valleys, filling them with ice, and carrying bowlders from the mountain tops to the opposite sides of the valleys.

Such announcements were received with much caution by some of the leading scientists at that time. HUMBOLDT himself, who then stood at the head of the scientific world, was unwilling to give credence to this new geological theory, and though he was a warm personal friend of young AGASSIZ, tried to dissuade him from his glacial studies and theories. But the proofs of the former extension of the glaciers were so convincing that opposition to such a theory could not last long. At the time, though, to use AGASSIZ'S own words, while yet "deeply depressed by the skepticism of men whose scientific position gave the right to condemn the views of younger and less experienced students," he went to Great Britain for the purpose of looking for traces of glaciers in those islands. Fresh as he was from the study of the ancient glaciers of the Alps, he had no difficulty in finding the evidences of glaciation through the British Isles, a country whence every vestige of perpetual snow has disappeared.

If the original theory of the glaciation of Switzerland was startling, and put to the test the credulity of those scientific men

who had no opportunity of examining the evidences for themselves, what can be said of the announcement that a large part of northern Europe, part of England and Ireland, and all of Scotland had once been buried beneath glaciers continental in their dimensions? Yet the evidences of glaciation are just as clear in some parts of northern Europe and in Scotland as in Switzerland itself.

THE QUESTION IN NORTH AMERICA.

By the time the agitation of this question reached North America the study of glaciers had gone so far, and their movements and work were so well understood, that the whole question was very much simplified for us. In his address before the American Association of Geologists, delivered in Philadelphia, April 5, 1841, Professor EDWARD HITCHCOCK, State Geologist of Massachusetts, expressed the feeling of many of our geologists in regard to this subject. He said, referring to what were then known as the diluvial phenomena: "But the recent work of AGASSIZ, entitled '*Etudes sur les Glaciers*,' gives a new aspect to the subject. It is the result of observations made during five summers in the Alps, especially upon the glaciers, about which so much has been said, but concerning which so little of geological importance has been known. Henceforth, however, glacial action must form an important chapter in geology. While reading this work and the abstracts of some papers by AGASSIZ, BUCKLAND, and LYELL, on the evidence of ancient glaciers in Scotland and England, I seemed to be acquiring *a new geological sense;* and I looked upon our smoothed and striated rocks, our accumulations of gravel, and the *tout ensemble* of diluvial phenomena with new eyes." In a foot note he adds: "A flood of light having been thus unexpectedly thrown in upon my mind, I am free to acknowledge that many of my difficulties in respect to this theory have been removed."

The magnitude of the glaciated area in this country, however, was simply appalling, and especially so in view of the fact that not only the glaciers, but every trace of their remnants, as such, had disappeared as completely as they had from England,

Scotland and Ireland (with the exception of the existing glaciers of the Sierra Nevada).[1] Here we had a glacier covering a great continent—a continental glacier. At present no such bodies of ice are known on the face of the earth, except under the poles. Greenland presents the largest expanse of ice moving as a glacier or glaciers of which we have any knowledge, and one can, perhaps, get no better idea of how our own country appeared during the glacial epoch than by reading the description given by NORDENSKIOLD of the interior of ice-covered Greenland. And yet, in point of size, Greenland is very insignificant when compared with the glaciated area of North America.

Doubtless the greatest difficulty in the way of those who objected and who may still object to the glacial theory, comes from the fact that existing conditions are so very different from those which must have obtained during the glacial epoch.

THE QUESTION IN NORTHEAST PENNSYLVANIA.

It is with great difficulty that we can realize the conditions of those times. At Scranton we must picture to ourselves the Lackawanna-Wyoming valley filled with one solid, slowly creeping mass of ice, rising high above the mountain tops to the east and west of us, while stretching away to the north this great ice-field was unbroken. To the southwest it came to an end a few miles below Shickshinny, while from it flowed away innumerable muddy streams, swollen by the water from the melting ice. During summer time the heat of the sun melting the surface of this great ice-field, and especially along its southern margin, must have covered it with water, which, draining away toward the south, flooded the valleys of the Susquehanna and Delaware and of the other streams heading in northern Pennsylvania and southern New York, and carried down the sands, clays and gravels that are now found over the flood plains of those streams. In the course of time, and gradually, the climate over this ice-covered region modified in a very marked degree. The

[1] For an account of these glaciers see "Existing Glaciers of the United States," by J. C. RUSSEL, in the fifth annual report of the U. S. Geological Survey, 1883-4, pp. 309-355.

cold of the polar regions was replaced by an average annual temperature approximating, at least, to that of our present climate. In the presence of such an annual temperature, it was, of course, impossible for the precipitation of snow during the winter months to replace that melted by the heat during the summer, and the line of perpetual snow retreated gradually northward. Under a milder climate, summer sunshine and warm rains, the surface of this vast glacier must have melted rapidly, especially during the summer, while floods of immense volume and power swept and overwhelmed these valleys, and what are now the fertile plains of New Jersey, New York and Pennsylvania, rearranging, resorting and redistributing the sand, gravel and material of all kinds brought down by the moving ice. It did not disappear in a single year, but summer after summer these floods were repeated until the retreating glacier had been melted from the basins that pour their waters into the Lackawanna and Susquehanna rivers.

This must suffice to give you a general impression of what appears to have taken place in this part of the country during the glacial epoch.

A LOCAL QUESTION AND ITS IMPORTANCE.

The glaciation of the region about Scranton is necessarily, then, a local question. But local questions are frequently like special questions or special subjects—world-wide in the application of their principles. No successful or trustworthy generalizations can be made, unless they are based upon careful investigations of special subjects. The broadest, most sweeping, and, to biologists, most useful generalization of modern times is that of natural selection, embodied in the theory of evolution. This grand generalization was only made possible by the work of specialists, and by a man who could do and did special work. Special work is, in a certain sense, local work. We should bear in mind, then, in the study of all local and special questions that "the explanation of one very local and limited problem may clear up many collateral ones when its solution includes the answer to a whole set of kindred inquiries."[1]

[1] L. AGASSIZ, *Geological Sketches*, Vol. II, p. 32.

AGASSIZ studying the glaciers of the Alps was studying glaciers wherever they may be found upon the whole globe, and those of you who may become interested in this delightful subject, may study it here in your own beautiful valley and on your own hills very much as you would if you took in all the glaciated areas of the earth. It must not be lost sight of, then, that the limited region of which I speak is but a small part of the region in this country which was once covered with ice, to say nothing of the former extension of the ice in other countries.

The ease or difficulty attending the working out of problems in glacial geology depends upon many varying circumstances and conditions. Now, after the nearly fifty years during which geologists have been acquainted with the problems connected with this subject; after the work and observations that have been made in so many parts of the world, we know pretty well what to look for, and are therefore the better able to find it. As might be expected, the places most accessible and most suggestive to geologists, are in the regions of the retreating glaciers of the Alps or of Norway and Sweden; and those who devote themselves to the study of glaciation to-day, generally turn to the mountains of Switzerland and Scandinavia as pilgrims toward their Mecca. In such places the relations between existing and ancient glaciers are seen better than elsewhere in the world, and nothing could have been more natural than that the importance of this subject should have first been recognized in the Alps, and should have spread out thence over the whole scientific world.

OBJECTIONS TO THE THEORY.

The first obstacles one encounters in beginning this work are the objections that have been raised to the glacial theory, and it is but fair that I tell you what these objections are. As I have already said, when this theory was first advanced, it was received with great caution, and by some it was strenuously objected to.

THE ICEBERG THEORY.

One of our American geologists, Sir WILLIAM DAWSON, principal of McGill University, Montreal, the author of many valuable works upon geology, is the leading living opponent of the glacial theory as held by most geologists the world over.

The loose surface material scattered over almost all the northern part of North America is generally spoken of as "drift," "glacial drift," etc. Referring to this drift material, Sir WILLIAM DAWSON says:[1] "If we ask what has been the origin of this great mass of shifted and drifted material we raise one of the most vexed questions of modern geology."

This was doubtless true forty years ago, but it is a strong statement for these times; for it is safe to say that with the exception of Sir WILLIAM DAWSON himself, there are but few geologists, either in this country or abroad, who are not fully convinced of the general adequacy of the glacial theory. After making the statement quoted above, Sir WILLIAM DAWSON proceeds to show what he believes to be the inadequacy of the evidences adduced by glacialists. This inadequacy lies, he thinks, in the absence of proper conditions for the production of a glacial period. "It is well known," says he, "that the ordinary conditions required by glaciers in temperate latitudes are elevated chains and peaks extending above the snow line." Therefore, "there must have been immense mountain chains which have disappeared," a supposition which "has no warrant from geology."

The explanation offered by him for the phenomena known as glacial phenomena is to the effect that when the so-called glacial striæ were produced, and when the drift material, bowlders, etc., were deposited over this country, the country was sunk beneath a shallow ocean, and that icebergs drifting southward from the cold arctic regions, dragged their bowlder-set bases over the rocky sea-bottom, thus cutting the striæ we now find upon the rocks. When these icebergs melted, the material frozen in the ice, the bowlders, sand, etc., would sink to the bottom, and leave such a deposit as our drift. The direction of

[1] *Acadian Geology*, 3d edition, 1878, p. 64.

the striæ along the valley of the St. Lawrence is held to indicate that it would have been impossible for a glacier to move up this valley from the northeast to the southwest, that is, from the Atlantic into the interior. These indications are regarded by Sir WILLIAM DAWSON as disposing of the glacial theory, for, says he, "we cannot suppose a glacier moving from the Atlantic up into the interior. On the other hand, it is eminently favorable to the idea of ocean drift. A subsidence of America, such as would at present convert all the plains of Canada and New York and New England into sea, would determine the course of the arctic current over this submerged land from northeast to southwest; and, as the current would move *up a slope*, the ice which it bore would tend to ground, and to grind the bottom as it passed into shallow water."

He says, however, that he would not "exclude altogether the action of glaciers in eastern America," though he dissents from any view which "would assign to them the principal agency of our glacial phenomena." What are generally supposed to be moraines, he thinks must be old sea beaches, bars and old coast lines loaded with bowlders, etc. He thinks there may have been a glacier down the valley of the Saguenay, and, indeed, that glaciers may have flowed from the whole line of the Laurentian hills into the St. Lawrence valley, which valley was then an arm of the sea.

I shall not undertake to discuss the iceberg theory at length. I may say, however, that we have satisfactory evidence of this continent's having been, at one time, elevated to the north, so that ice moving southward along the St. Lawrence valley did not necessarily move up a grade. Again, if what are regarded as moraines were old sea beaches, they would lie in the same horizontal plane, while, as a matter of fact, they lie across hills and valleys like a thread thrown loosely across an uneven surface.

Not to recapitulate all the objections to this iceberg theory, I may call your attention to the fact that we have in this region evidence which shows, beyond question, that the work here, at least, is not that of bowlder-set icebergs. Conceding that icebergs by dragging may striate the rocks of the bottoms of shallow seas, it does not seem possible that they could have dragged

their bases across mountain tops and valleys alike, especially when the valleys are more than 1,200 feet deep, as ours are here. Either they would have grazed the mountain tops and missed the deep valleys, or they would have dragged across the valleys and stranded against the mountain tops. Neither does it appear that they would have dragged squarely across the tops of peaks as sharp as Elk Mountain, but that they would have been thrust to one side or the other. But what appears to be the best evidence against this theory consists in the existence of striated rocks, where the marks are in such a position that it is not possible that they could have been made by dragging icebergs. In the rear of the railway station at Taylorville are many exposed and beautifully striated rock surfaces, many of the marks running up the rounded faces of the rocks. At a short distance below the station, along the railway track, from one hundred to two hundred feet, there is a small and otherwise insignificant ledge left by the rock on the northeast side of a joint having been carried away. The surface so exposed is from one to two feet wide, perhaps ten feet long, while the northwest end is so high that it makes an angle of about forty-five degrees with the horizon and a large angle with striæ at its upper end. The smooth face of this ledge, instead of being perpendicular, overhangs like the right side and top of the letter Z. The face of this little overhanging wall is much striated, the marks pointing downward and parallel with the length of the wall. To have produced such striæ the ice must have been pushed forward, up, and over the rounded rocks immediately to the northeast, and then, being caught beneath the projection here referred to, was carried down the whole length of this little wall. An example of a very similar kind may be seen in the quarry below plane number seven of the old Pennsylvania gravity road above Dunmore, where the ice was caught beneath a ledge which overhangs like the eaves of a house. Surely no one will claim that icebergs dragging loosely over the sea bottom could striate the lower sides of such ledges as these, while it is well known that glacial ice is quite capable of doing so.

In his *Acadian Geology*, p. 73, Sir WILLIAM DAWSON says, in defense of the iceberg theory: "The material of moraines is

all local. Icebergs carry their deposits often to a great distance from their sources." Whether the first of these statements is true must necessarily depend upon the length of the glacier, but even granting that it is correct as it stands, the local nature of the drift of this valley, referred to hereafter, would, by Sir WILLIAM DAWSON'S own admission, conflict seriously with the iceberg theory. It should be recalled, however, that this iceberg theory was held not many years ago by a considerable number of geologists. But it has lost advocates as rapidly as geologists have given their serious attention to the subject. As long ago as 1866 Dr. ARCHIBALD GEIKIE, Director of the Geological Surveys of Great Britain, after studying the old and existing glaciers of Norway, said that his study of them "confirmed in a most impressive way the conclusion which has gained ground so rapidly within the last few years, that the glaciation of the Scottish Highlands, as well as of the rest of the British Isles, is, in the main, the work, not of floating bergs, but of land ice. This conclusion may indeed be regarded as demonstrated beyond all cavil by the ice marks of Norway."[1]

OTHER OBJECTIONS.

One of the Scandinavian geologists, HOERBYE, objects to the theory of glaciation, even in the presence of extensive evidence compiled by himself among the Scandinavian mountains. He thinks this work is due to some more powerful and general agency than that of ice. The glaciers, he thinks, are of a more local nature. He does not, however, suggest what this agency may have been.[2]

One explanation seriously offered for glacial phenomena, and at one time held by several prominent geologists, deserves mention here as showing to what straits we are sometimes put for explanations of natural phenomena when there is nothing within the range of our experience to suggest the right explanation. This theory may be called the diluvial, or par-

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[1] *Geological Sketches*, by ARCHIBALD GEIKIE, F. R. S., N. Y., 1882, p. 144.

[2] *Observationes sur les Phenomenes d'Erosion en Norvege*, par J. C. HOERBYE, Christiana, 1857.

oxysmal movement theory. In an address delivered before the Association of American Geologists and Naturalists in 1844, Professor HENRY D. ROGERS, State Geologist of Pennsylvania, defended this remarkable theory. He spoke of a violent movement which sent "water, ice and fragmentary rocks in a succession of tremendous deluges southward across the continent."[1] But I cannot do better than quote Professor ROGERS'S own words upon this occasion, and to call attention to the names of the distinguished geologists mentioned in connection with this theory.[2] "My brother and myself * * * have appealed to the enormous erosive power which a thick and ponderous sheet of angular fragmentary rock would possess, if driven forward at a high velocity under the waters of a deep and general inundation excited and kept in motion by an energetic upheaval and undulation of the earth's crust during an era of earthquake commotion." "These disturbances, which are conceived by VON BUCH, DE BEAUMONT, HOPKINS, DE LA BECHE, SEDGWICK, PHILLIPS and other distinguished geologists to have been of the nature of simple paroxysmal elevations, and by my brother and myself to have consisted in an energetic and extensive undulation of the crust of the earth accompanying each sudden rise, are deemed sufficient to have caused a rush of the northern waters over all the high latitudes of Europe and North America, covering the surface with an almost continuous sheet of gravel and bowlders, and polishing and scoring the whole rocky floor."[3]

It is remarkable that the address containing these words was delivered in 1844, three years after that by Professor HITCHCOCK delivered before the same body, and already quoted, which accepts the glacial theory as affording the long needed solution of the drift and its associated phenomena. This paroxysmal diluvial theory may be said to belong to the dark ages of glaciation, and no one who has studied the matter seriously thinks of bringing it forward to-day.

Another explanation of glacial phenomena has been offered, which, while it is not worthy of serious consideration, has

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[1] *American Journal of Science*, Vol. XLVII, 1844, p. 137 *et seq.*
[2] *Ibid*, p. 289. [3] *Ibid*, p. 271.

appealed more or less to those who love the mysterious rather than the natural, and to those who accept highly distorted evidence at second-hand. I refer to a book known as "*Ragnarok*," the author of which undertakes to show that what geologists and physicists recognize as the work of ice, are the effects of the earth's having been struck by the tail of a comet. I have no intention of criticising this book, for it is not worthy of serious criticism. A few well known facts are used to give the work an air of respectability, just as the lion's skin gave the ass a dignity which did not rightfully belong to him. I would only say in passing, that such a book, whether it relates to geology or to some other science, does a vast deal of harm among those who are not in a position to distinguish readily between the valuable and the harmful, the true and the false; it gives the impression that science is tricky, illogical, elusive and mysterious, while, in truth, it is just the opposite of all these. The spread of education is slow enough at the best, and it is the duty of educated people to discountenance the inculcation of vapid nonsense about a subject, which is worse than downright ignorance of it.

EVIDENCE SUSTAINING THE GLACIAL THEORY.

In some parts of the glaciated area the evidences and effects of glacial action are very marked, while in others they are more or less problematical. The evidences of such action all through the region about Scranton are quite plain, and the glacial geology of this region is particularly interesting. This is due partly to the fact that this region is not far from the southward ending of the ice sheet; partly to the difference between the geologic ages of the rocks just here, and of those lying but a short distance to the northward; partly to the irregularities of the surface and the inclination of the valley and its bordering mountains to the general course of the glacier when it was largest; and partly to the existence of the valley itself, through which the waters from the retreating glaciers were drained.

The evidences, generally accepted as conclusive, that this

part of the country was once deeply buried beneath ice which moved to the southwest as a glacier are the following:

First, The parallel striæ, scratches or furrows upon the solid rocks all over this region, in every respect like those upon the rocks over which existing glaciers move.

Second, The presence of bowlders and fragments of rocks, of various sorts and sizes, which do not exist here in beds, but which are found in place mostly to the north and northwest.

Third, The scratches and grooves upon these bowlders, showing that they have been ground against the rocks while being transported in the ice. In form and markings these striated bowlders are, in every respect, similar to those characterizing the existing glaciers of Switzerland and Scandinavia.

Fourth, Till or bowlder clay, consisting of heterogeneous masses or accumulations of clay, sand, gravel, pebbles, cobblestones, bowlders and rock fragments of various sizes miscellaneously commingled.

Fifth, All the signs of the action of water which we might expect to find in a region once covered by ice, but which has been washed by the floods that would naturally characterize the disappearance of a great continental glacier.

Sixth, Pot holes on high ground, of sizes and under circumstances which preclude the supposition that they could have been formed otherwise than by water falling from a great elevation. The great elevation in such cases appears to have been supplied by the thickness of the ice, from the top of which the streams plunged through a crevasse.

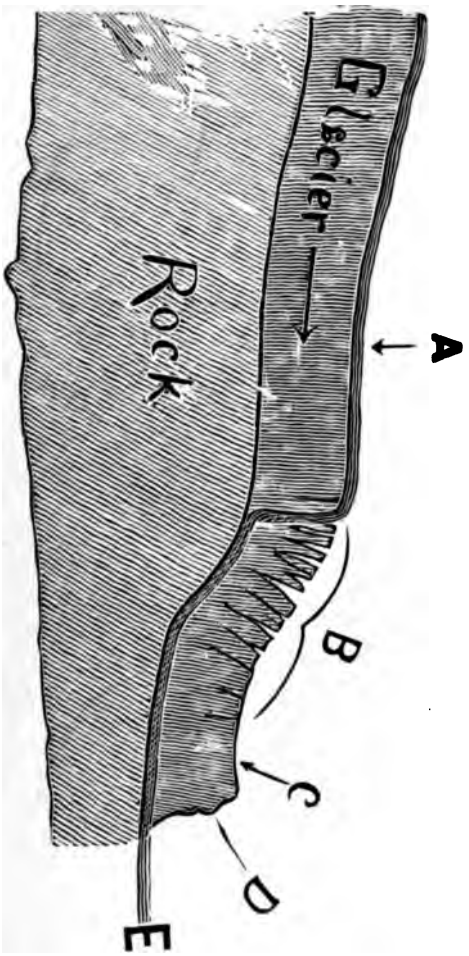
Seventh, Kettle holes, or closed depressions in the drift.

Eighth, A general rounding of the hills upon the side from which the ice came.[1]

BIOLOGIC EVIDENCE.

Geologic evidence as found in the rocks and drift is strengthened by botanical evidence. As the ice sheet pushed forward, vegetation was also crowded southward; not necessarily

[1] This effect on the topography is quite apparent in some parts of this region, but not so much so as in many places in Great Britain and northern Europe.

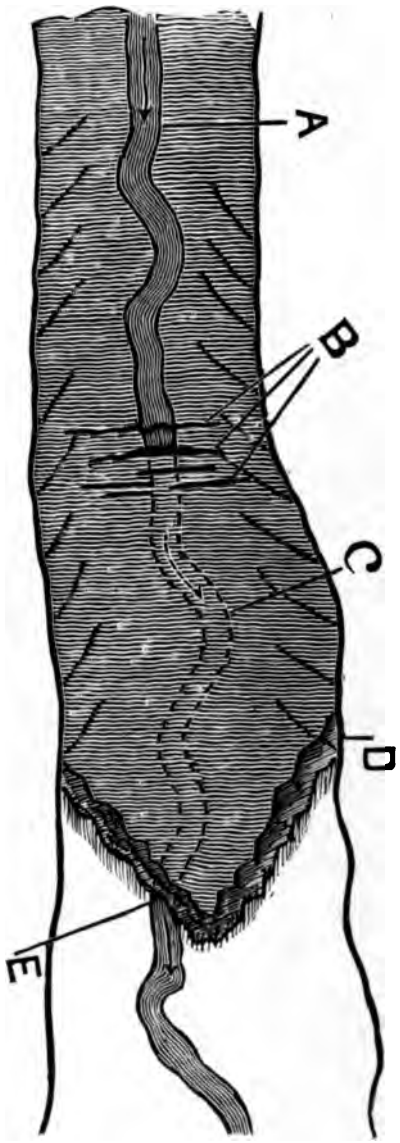


Cut No. 1.—Ideal section through a glacier breaking over a ridge.

"A" represents the stream upon the glacier surface.

"E" the same stream emerging from the glacier.

"B" represents the crevasses in the ice breaking over the ridge.



Cut No. 2.—Ideal plan-view of glacier.

"C" represents the under-glacier stream, having entered the crevasse at "B" and emerging again at "E."

The pot-holes are formed at "B."

CUTS ILLUSTRATING FORMATION OF POT-HOLES.

by the ice itself, but by the cold climate accompanying it. We have, therefore, plants belonging and originally confined to higher latitudes carried southward along the lines followed by the ice. When the ice retreated northward these plants, unfit for the encroaching warmer climate, died out in the lower and were confined to the higher and cooler elevations. Hence we have on our higher mountains and cool, dark ravines in this country, a peculiar flora, and one closely related to those of polar and subpolar regions. Botanic facts thus aid in the solution of geologic problems. At the same time botanists are aided in the solution of questions relating to the geographical distribution of plants, a subject upon which Professor DUDLEY has already addressed this Society.[1]

Collateral evidence is also found in the distribution of certain forms of animal life. Mr. A. R. GROTE has shown how northern forms of animal life, for which a more southerly latitude was made inhabitable by the cold of the glacial epoch, have been left by the retreating ice upon the alpine summits of our highest mountains.[2]

DIRECTION OF THE MOVEMENT.

The general direction of the movement of the ice was from north to south. My own study of the glaciation of this region seems to show that the glacier moved in one direction when it was thickest, and that as its southern margin melted and became thinner, it came more and more under the influence of the hills and valleys of the region, and changed its direction, in some instances until it moved at an angle of one hundred and thirty degrees to its original course. The direction of the ice movement is usually determined without difficulty by the channels or striæ left upon the solid rocks. Sometimes the striæ broaden out at the end toward which the movement took place, and frequently end in a deep gouge. These scratches seem to have

[1] See also *Proceedings of the American Association for the Advancement of Science*, Vol. XXI, 1872, pp. 1 *et seq.*, presidential address of Professor ASA GRAY.

[2] "The Effect of the Glacial Epoch upon the Distribution of Insects," read before the A. A. A. S., 1875.

been formed by the stones having been held firmly in the bottom of the ice as they were pushed forward over the rocks. Some of these fragments were evidently of such a shape, and held in such a position, that, as they were propelled forward, they cut deeper and deeper into the rock, just as a knife, held in the hand and pointing forward, when pushed along the surface of a soft material, such as wood or lead, will cut deeper and deeper into it, until it is impossible to push the knife, when it will turn over if the grasp is not firm, or break if it is firm. A stone cutting in such a manner into the bed-rock would be permitted by the ice to turn over when the bite got too deep.

After the observations that have been made all over this country, it may be taken as a general rule that the movement was in a southerly direction. There are, however, places where the topography modified the direction of the ice current to such an extent that it ran east or west, or nearly so. In such places, or in any place where there is considerable variation from the usual bearing of the striæ, these deepened and broadened ones are of great assistance in showing the direction of the great glacier. But even if we had no striæ to guide us in the determination of the flow, there are other evidences of value when large areas are taken into consideration. I refer to the fragments of rocks of various kinds brought down by the ice. We may readily imagine conditions under which this method would be even more valuable than the first mentioned. Suppose, for example, that to the west of us were an outcrop of rocks of a certain kind, and that no such rocks were found anywhere to the north of this region. Now, if the drift about us were filled with fragments of this peculiar rock, the striæ remaining as they are, we should be forced to the conclusion that the glacier originally came from the west, and that its direction was changed only toward the close of the glacial epoch, the existing striæ recording the direction of the latest ice. This method is most valuable where no striæ are accessible, the rocks being buried under a deep deposit of drift.

THE THICKNESS OF THE ICE.

It should not be lost sight of that while existing glaciers obey the same physical laws that were obeyed by the ice of the glacial epoch, existing glaciers are, as Professor EDWARD HITCHCOCK has well said, only miniature representations of those of former times. We are not simply to imagine an Alpine glacier spread out across our country, for the ice was so thick that it not only buried our hills and mountains completely out of sight, but rose high above those within the glaciated area. The evidences of this great thickness are abundant in this vicinity. I have found many glacial striæ and transported bowlders upon the summit of Bald Mount, showing beyond question that the ice flowed over the top of that high point. Many of you have seen similar evidences upon the summit of Penobscot Knob near Wilkes-Barre. I have found them also along the summit of the Lackawanna Mountains and of the Moosic range. Several of the high points along these mountains rise over 2,000 feet above tide. As Scranton is 740 feet at the D., L. & W. Railroad station, it is evident that the ice over this place was, at the very least calculation, 1,260 feet deep. But the probabilities are that it was very much thicker. Prof. I. C. WHITE, in report G5 of the Pennsylvania Survey, says that he has observed evidences of ice action in this part of the State as high as 2,200 feet above tide, and no higher. During a trip to Elk Mountain with the summer class in geology a few days since, I found that the ice was thicker than Professor WHITE had supposed. On the very summit of the highest part of that mountain Mr. D. N. GREEN and I found striæ as well defined as any to be found in the glaciated regions of this country. The existence of these ice marks shows that the glacier flowed high above this point, the highest in northern Pennsylvania, 2,700 feet above tide, and that the ice at Scranton was, by this measurement, at the least about 2,000 feet thick. Our measure, or what was supposed to be a measure, for the thickness of the ice in this part of the country has thus disappeared, and we must look to higher elevations within the glaciated area for the record of the depth of the ice.[1]

[1] See *American Journal of Science*, Nov., 1886, "The Thickness of the Ice in Northeastern Pennsylvania," by JOHN C. BRANNER.

Mt. Washington, in New Hampshire, is the highest peak within the glaciated area east of the Mississippi. But it was long ago pointed out that even the summit of this peak was covered by ice. We have, therefore, no measure, either in this State as it was supposed, or elsewhere, for the thickness of the ice at any considerable distance from its southern margin. In view of the fact that Mt. Washington was covered by the ice, and in view of the utter disregard of the glacier for the marked topography of this mountainous region, it is not surprising that we find the top of Elk Mountain showing signs of having been covered by ice.

ECONOMIC VALUE OF GLACIATION.

In non-glaciated regions all the soil, except that made by the deposition of alluvium, is formed directly from the rocks by the ordinary process of weathering and decomposition. In glaciated regions the soil is formed of the material brought down by the ice and acted upon by the usual disintegrating forces, and, being of a miscellaneous composition, it is more nearly allied to the rich alluvial soils than to the residuary soils—(those derived directly from the rocks). Whether the drift brought into a given region be valuable or otherwise depends, therefore, upon the origin and nature of the material, for the drift does not make a soil which is universally good or universally poor. On an average, however, the soils of drift-covered regions are very fertile, and this is especially true of regions to which the drift has been carried a long distance, and has thus had an opportunity to become thoroughly mingled. In the second volume of the Geological Report of Wisconsin, Dr. T. C. CHAMBERLIN, State Geologist, says of the drift of that State: "The powdering and commingling of such a vast variety of minerals by the glacial forces was a process than which none could be better suited to produce a secure and permanent foundation for agricultural industries; a resource for the many, not for the few—a wealth for the people."

What is known as the driftless region of the Northwest lies within portions of the States of Illinois, Wisconsin, Minnesota

and Iowa. During the glacial epoch this region was untouched by the great ice sheet, and we can here compare without difficulty the values of glaciated with unglaciated lands. Such a comparison has been made by Dr. CHAMBERLIN, who is *facile princeps* on the subject of glaciation in this country, if not in the world, and he reaches the conclusion that there is, at the very least, a difference of value between the glaciated and unglaciated lands amounting to ten dollars in its selling price.

The Western Reserve of Ohio is "the great dairy district of the West." This whole region is covered with glacial drift, known there as the Erie clay. Professor WRIGHT, in speaking of the economic importance of the drift in the State of Ohio, says:[1]

"The ice movement of the glacial period pretty much made the inhabitable portions of this State. It determined the character of the soil, the contour of the country, the minor lines of drainage, and thus, in a thousand ways, had to do with the pleasure, the health and the prosperity of the present population. As, a few weeks ago, I marked off the glacial limits on a map of this State, the Secretary of the Board of Agriculture at once remarked to me that that was the southern boundary of the great wheat producing portion of the State. * * * Certainly if one is to buy a farm in Ohio he should pray that it be either in a river valley or north of the terminal moraine."

The material of the drift, however, is not in all cases useful. When it is made up almost entirely of bowlders, the land becomes very difficult and sometimes impossible of cultivation. Not a few such places have come under the observation of the speaker. When the bowlders do not reach such extraordinary numbers, they are not infrequently regarded as useful rather than otherwise, as they are turned to account in making stone walls about the fields. When they are abundant and large enough they are sometimes used for other building purposes.[2]

Every one who has visited the city of Ann Arbor in Mich-

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[1] "*The Glacial Boundary in Ohio, Indiana and Kentucky*," by G. F. WRIGHT, Cleveland, 1884, p. 23.

[2] Some idea of the "bowlder belt" in Ohio may be had from Professor EDWARD ORTON'S description of Preble County in the *Geology of Ohio*, vol. III., p. 413.

igan must have been struck by the beauty of the material of which some of the principal buildings of the place are made. Bowlders of Archæan and other rocks of various colors and kinds have been taken from the drift of that region, broken into shape and used for building churches and elegant private residences. The effect of the contrasted brilliant colors is most pleasing, while the rock is of the most substantial character. In some parts of the country the drift contains bowlders of limestone that are burned extensively for lime.

The drift soils of the Northwest are noted for their strength and fertility.[1] They are spoken of "as the most reliable soils, for all the purposes of the farmer, that are known."[2]

In the Lackawanna valley the drift has not done as well by the people as it has in many other parts of the country. The reason is that the great body of the drift through this coal basin is, or seems to be, local. The little material brought into the valley has come, not from the rich limestone regions far to the north, but, for the most part, from the poor hills of Pocono sandstone along the northwest border of the valley, and from the comparatively poor region lying to the immediate north of those hills. I have already pointed out in another paper[3] that Scranton has been able to obtain such excellent soft water for the city supply, simply because the bed rock and the drift over the region from which it is brought is free from limestone.

ORIGIN OF THE DRIFT MATERIAL.

The drift of this region is all local, as far as my studies have thrown light upon the subject. In the State of New York, north of Scranton, the drift is characterized by fragments of various sizes and sorts brought from the outcrops of the Laurentian rocks in the Adirondacks and in Canada. During my exploration and study of the Lackawanna region I kept a constant lookout for such specimens, but, with the exception of a few pebbles found along the Susquehanna River, no such have

[1] *Geology of Minnesota*, vol. I., p. 385.
[2] *Geology of Minnesota*, vol. I., p. 351.
[3] *Proceedings of the American Philosophical Society*, 1886, p. 351.

been seen here by me. It is possible, however, that further search may discover specimens of these Archæan rocks. It should be borne in mind, though, that specimens found along the Susquehanna River below Pittston may have been brought down from the higher parts of the glaciated areas by having been frozen into the river ice, or simply by the impact of the river current exerted over a long period of time, and especially during freshets. The largest bowlders seen within the valley, and that have unquestionably come from beyond its borders, are those of the "Cherry Ridge limestone," brought, in all probability, from Susquehanna County. Some of these bowlders are to be seen upon the farm of Mr. W. H. RICHMOND near Dickson City. They are of an "impure calcareous conglomerate or breccia."[1] In Susquehanna County they are known as "nigger-heads."

THE CAUSES OF THE GLACIAL EPOCH.

It is clear that during the glacial epoch the line of perpetual snow descended from the lofty mountains and from the polar regions into what is now the north temperate zone, and that the climate of this region was an arctic one. The cause of this depression of the line of perpetual snow was the cause of the glacial epoch itself. The theories advanced and the causes assigned for this great change of climate it is impossible for me to take up here. I refer those who may be interested in them to the works of CROLL, WALLACE and GEIKIE. I may say, however, that, as Mr. WALLACE has pointed out, some of the supposed causes are inadequate, while others are too hypothetical, for we have no evidence that they have been in operation during geologic times. This question is a profoundly interesting one, but it is necessary, in order to understand it, to explore other fields, for the questions raised are mainly astronomical ones. A great deal has been written upon this subject, and ably written, too, but no single explanation that has been offered, has been generally accepted, and the question is still an open one, and likely to remain so until we shall have found un-

[1] *Report G5 of the Geological Survey*, pp. 30, 65.

questionable evidence with which to substantiate some of the theories suggested. One of the objections on the part of geologists to accepting the more or less elaborate astronomical theories advanced has been that they have thought that there was no unquestionable evidence of other glacial epochs in geologic periods either near or remote. If a glacial epoch is due to astronomical causes, the epoch should return with the regularity of the astronomical phenomena themselves, and we might expect to find buried beneath the rocks of various ages the evidences of other glacial epochs than the one or two with which we are acquainted, and which, geologically speaking, belong to our own times. I should add, however, that the existence of certain beds of conglomerate is now accepted by many of our ablest geologists as evidence of former glacial epochs.

THE RECURRENCE OF THE GLACIAL EPOCH.

As a speculation it may be interesting to enquire in regard to the probability of the glacial epoch returning upon the earth. If it is due to periodic astronomical phenomena, we may safely infer that the north temperate region of the earth will again be invaded by ice. If the brecciated conglomerates at various horizons are the results of ice-drifted material, we can only expect a return of the conditions that have so often obtained upon our globe. But the human race has already seen the ice invade and retreat from what are now some of the most productive and important parts of the earth, and as the last glacial epoch has, as it were, but just closed, it is "with reason that we regard its recurrence as belonging to the distant future. The world is just through one of these paroxysms, and man may disappear before it is subject to another."[1]

WORK THAT MAY BE DONE ABOUT SCRANTON.

Now what contributions can the field geologist of this region make to our knowledge of glaciation?

In a paper contributed to the American Philosophical

[1] *Glaciers*, by SHALER and DAVIS.

THE GLACIAL POT-HOLE NEAR ARCHBALD.

Society, and published in its Proceedings (1886), I have given some of the results of my own observations made upon the glaciation of this region. As far as I am aware, that paper contains all that has thus far been published on this subject, and may serve as a starting point for those who are inclined to pursue this interesting work in the field. Problems for investigation are there indicated which may prove fertile ones in the hands of those who are ready to patiently work them out.

I will briefly state what appear to me to be subjects which, in this connection, require farther elucidation or corroboration.

First, The source of the drift; is it all local, or are there bowlders to be found here showing that they have been brought down from regions at considerable distance to the north? Are there not also fragments of Archæn rock to be found here, showing that the ice that flowed over the Lackawanna came originally from the Adirondacks at least?

Second, More evidence is wanted of the course in which the ice moved. The maps published by me in the paper referred to are very defective, in that, to say nothing of the poor work of the engraver, there are large areas represented from which no striations are reported.

Third, Double sets of striæ should be recorded with especial care, pains being taken to note which of the sets appears to have been made first. In a limited area these sets of striæ afford the readiest means of determining the different directions in which the ice moved at different times.

Fourth, The arrangement of the drift will give us an insight into the circumstances under which it was deposited in the water.

Fifth, The condition of the material of the drift will indicate whether it was brought here beneath the ice, ground against other fragments and against the bottom rock, or borne along upon its surface, or by currents of water. The material transported in the first mentioned manner is usually striated, the second angular, the third rounded and smoothed.

Sixth, The origin and explanation of the great Archbald pot-holes has not been settled to the satisfaction of all. Where did the water come from that ground them out? How did it

reach this altitude, two hundred and forty feet above the Lackawanna at Archbald? What are the indications of the direction and volume of the stream?

Seventh, In report Z of the Second Geological Survey of Pennsylvania, Professor LESLEY suggests that fluids flow downwards only, while the striæ left by the glacier seem to indicate that the flow was upwards. What are the indications of an upward flow? How is this apparent anomaly to be explained? Was the northern part of the continent tipped up till all flow was downward, or is ice capable of a local upward movement?

Eighth, What influence had the glacial epoch upon the flora of this region? Is the flora here an indigenous one, or has it been introduced from higher latitudes? Were our northern plants actually brought down by the ice or were they simply crowded forward along the Alleghenies by the encroaching cold?

Ninth, How has the topography of the region been affected by glaciation? Have our hills their original forms, or have their original forms been modified by the grinding of the ice? Which of our hills have been formed and left here by the retreating of the ice?

Tenth, What have been the effects of glaciation upon the natural development of this region; upon the soil, the water, the sanitary conditions?

Eleventh, How and when were the changes in the channel of the Susquehanna River below Pittston caused? Is this channel really the former bed of the Susquehanna River, or was it formed by a sub-glacial stream?

Twelfth, Upon one question geologists are somewhat divided. I refer to the wearing power of ice. Is ice moving as a glacier capable of doing extensive abrading, such as the cutting out from the solid rock of fjords and valleys and the forming of lake basins, or is its wearing power limited and capable of doing little more than to polish the surface and break off projecting points of rocks?

Thirteenth, Have you here any evidence of more than one glacial epoch?

Fourteenth, Are there any evidences to be found in the drift

of this region of the existence of animals during glacial or preglacial times that are now extinct?

Fifteenth, Are there here any evidences of the existence of man previous to the glacial epoch?

These are some of the questions connected with the glaciation of this region upon which the scientific world has a right to expect you to throw some light at least. They are not questions that you can solve in a week or a month; they will require the accumulated observation of months and years if your solutions are to amount to any thing. But in such work even those of you whose every day occupations lie in quite different directions, will find delightful recreation, and, aside from the value of your observations to science, you will find it a source of education which you little dream of now. Your opportunities here, both natural and artificial, are of the very best. You have an excellent laboratory at your very doors.

NOTES UPON THE GLACIAL STRIAE

OBSERVED IN

THE WYOMING-LACKAWANNA REGION.

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The following notes upon and list of localities at which glacial striæ have been observed in the Wyoming-Lackawanna region are contributed for the guidance of those who may be induced to take up the work in this interesting region where I have been obliged to leave it.

Observations have been made upon localities other than those mentioned in the present paper, but it is not found convenient to satisfactorily indicate them except upon a large and detailed map of the region. Still other places have been seen where the rocks are highly polished by ice action, but, except where the direction of striæ have been observed, these places are not here mentioned. Where the observations have been made by others the fact is mentioned with the note. It is hoped that the area of observations be extended and the number greatly increased. Other information, however, than the location and the bearing of striæ is highly desirable. The notes should include: (1) locality; (2) its elevation above tide; (3) the bearing of the striæ; (4) nature and depth of striæ; (5) nature of the rock on which they occur; (6) the angle made by the striæ with the horizon; (7) whether they appear to have been uncovered recently.

For making such notes one needs:

(1) A trustworthy pocket compass, but not necessarily an

expensive one. A compass set in a square wooden frame, and costing fifty cents, will answer the purpose perfectly.

(2) A clinometer for observing the inclination of the striæ with the horizon. A cheap clinometer, such as is used for observing the dip of a roof, will answer.

(3) An aneroid barometer for observing the elevation of the locality above tide. A small pocket barometer will serve the purpose. Observations on elevation made with a barometer should be based upon some point, the elevation of which is known, and should be repeated in order to be trustworthy.

If, however, it is not possible to make these observations as complete as is here suggested, one should not be deterred from recording any observations whatever.

BEARING.

STRIÆ IN THE VICINITY OF SCRANTON.

S. 45° W. Madison Avenue, near corner of Linden Street.

S. 50° W. Opposite the coal pockets of the L. I. & C. Co. on D., L. & W. R. R.

S. 20° W. Opposite the south end of the D., L. & W. R. R. tunnel in the gorge of Roaring Brook, on level with railway track.

This observation is important as showing that the Roaring Brook ravine, or the greater part of it at least, was excavated before the ice retreated from this part of the country.

S. 5°-48° W. One mile east of Scranton, in vicinity of Nay-Aug Falls. Noted and reported by D. N. Green, Esq., of Scranton.

S. 35° W. In "Little England," near the south end of the Erie and
S. 10° W. Wyoming railway bridge to Dunmore. Two sets.

In "The Notch," near the middle of the gap through the Lackawanna mountain. The rocks beside the D., L. & W. R. R. track are ice-worn, showing that this gap existed during the glacial epoch. This observation, however, is about 75 feet above the present stream.

S. 38° W.
S. 40° W.
S. 42° W. In North Abington, three-quarters of a mile N.W. from Dalton Station, on the D., L. & W. R. R., on "the hill road to Factoryville," and near "The Old Griffin House." El. at. 1300 feet. Those bearing S. 40° W. predominate. Excellent exposure. Reported by Mr. D. N. Green, of Scranton.

BEARING.

STRIÆ UPON BALD MOUNT.

These observations were made upon the summit of Bald Mount. Their great variation may be due in part to the smallness of the spaces upon which striæ were found. Some of them were the polished facets of pebbles held in position in disintegrating conglomerates. Most of them were also near the verge of the abrupt mountain sides.	S. S. 5° W. S. 6° W. S. 10° W. S. 10° W. S. 10° W. S. 11° W. S. 20–25° W. S. 20° W. S. 25° W. S. 33° W.
About half-way between the small stream, near the top of the mountain, and the summit, beside the road.	S. 15° W.
At the roadside, near the principal outlook to the east.	S. 40° W.

STRIÆ IN THE VICINITY OF DUNMORE.

Yard of Pa. R. R.'s office at Dunmore. Head of Plane No. 7 of the old Gravity R. R. track, and just above the house.	S. 80° W. S.
In the lumber road, passing Plane No. 8 of the old Pa. Gravity R. R., and opposite the head of the plane.	S. 10° W.
In road leading from lumber road to Plane No. 8.	S. 5° E.
Top of conglomerate ledge, 200 feet S. W. of Plane No. 7. Care should be taken here to avoid confusion of glacial marks with the many examples of slickensides in the quarry.	S.
Just below the last mentioned place.	S. 15° W.
Ten feet below the last.	S. 27° W.
South side of Roaring Brook, at the reservoir dam and the conglomerate.	S. 30° W.
Fifty feet above the last mentioned.	S. 20–30° W.
South of Roaring Brook, above reservoir dam, south of Erie and Wyoming R. R., and about 1200 feet due S. of the dam.	S. S. 15° W.
The south-pointing striæ predominate.	
On the hill, above the last and about 300 feet away. Three separate observations.	S. 20° W. S. 35° W. S. 35° W.
By the Drinker turnpike, between the crossing of the Winton branch of the D., L. & W. R. R. and Little Roaring Brook.	S. 30° W.
Up the Drinker turnpike, 400 feet in the direction of Plane No. 7 from the crossing of Winton Branch of D., L. & W. R. R.	S. 25° W. S. 35° W.
Up the Drinker turnpike, 100 feet beyond the last mentioned.	S. 30° W. S. 27° W. S. 24° W. S. 53° W.
Drinker turnpike, in gutter, south side of road, between Spencer Breaker and top of Sport Hill.	S. 40° W.

Bearing.	
S. 48° W. S. 55° W.	Junction of Erie and Wyoming R. R., with street car line, between Dunmore and Scranton.
S. 48° W. S. 50° W. S. 55° W.	Roadside, opposite Johnson's store, Dunmore.
S. 41° W. S. 45° W. S. 48° W. S. 50° W.	Dunmore, 300 feet south of the station of the Erie and Wyoming R. R.
S. 25° W.	Near hill top, S. E. of the Spencer Breaker.
S. 40° W.	Drinker turnpike, east of Dunmore, on top of Sport Hill.
S. 55° W.	Scranton and Dunmore road, 200 feet above the entrance of the Petersburg road.

STRIÆ IN THE VICINITY OF PECKVILLE.

The rocks near and west of Peckville station, on the D. & H. R. R., are much worn but no well defined striæ were found here.

S. 20° W.	1500 feet west of Peckville station, at the crossing of the Jessup road and the D. & H. R. R., west side of the track, on steep ledge.
S. 30° W.	700 feet N. E. of Peckville station, on the road leading from the station toward the iron bridge over the Lackawanna.
S. 30° W.	At the shallow cut on the N. Y., Susq. & W. R. R., opposite and 500 feet S. E. of the big culm pile of the D. & H. Co. above Peckville.
S. 25° W.	In the road leading from Jessup to Dolph's breaker, and within 1400 feet of the breaker.
S. S. 25° W. S. 30° W.	In the road between Dolph's drift and its air-shaft.
S. 30° W.	On the Moosic Lake road, 1100 feet above where it crosses the D., L. & W. R. R. branch to Dolph's drift.
S. 45° W.	On the road from Peckville to Moosic Lake, 3900 feet from where it crosses Von Storch's creek.

STRIÆ IN THE VICINITY OF WINTON.

S.	800 feet north of a point half-way between the Winton bridge and the railway bridge of the N. Y., Susq. & W. R. R. over the Lackawanna.

STRIÆ IN THE VICINITY OF CONSUMERS' POWDER COMPANY'S WORKS.	BEARING.
Winton branch of the D., L. & W. R. R., 1500 feet along the track S.W. of the switch of the branch leading to the Rough and Ready breaker. Upper side of the track.	S. 30° W.
100 feet S.W. of the last named place and by the track.	S. 25° W.
Winton branch of D., L. & W., 2700 feet S.W. of the switch to Rough and Ready.	S. 30° W.
By the same track, 600 feet S.W. of the last named point.	S. 25° W.
By the same track, 1100 feet S.W. of the last named point.	S. 25° W.

STRIÆ IN THE VICINITY OF ARCHBALD.

On the road from Archbald to South Canaan and 4600 feet above where it crosses the Pierce Coal Company's railway.	S. 22° 30′ W.
On the road leading from Archbald to the Ridge Mines, and 1100 feet above where it crosses the track of the Gravity R. R.	S. 22° W. S. 10° W.
600 feet west of where the light track of the Gravity R. R. crosses the "Old Plank" road between Archbald and Peckville. On the edge of the rock cut of the railway.	S. 20° W.
About 100 feet S.W. of the railway crossing just mentioned and on the west side of the "Old Plank" road.	S. 10° W.
Hill top on the "Old Plank" road between Archbald and Peckville. The first two are together and cross each other.	S. 10° W. S. 21° W. S. 30° W.
On the hill north of Archbald where the lumber road passes around the highest part of the hill.	S. 10° W.
Above Archbald, on the west side of the river and above where the Gravity R. R. track crosses the Lackawanna; on the steep hill side. For some distance south of the bridge the bearing was the same for a large number of observations.	S. 12° W.
On the east side of the Lackawanna, above the D. & H. R. R. tracks and east of the bridge of the Gravity R. R.	S. 19° W.
On the D. & H. tracks, about 600 feet south of the water-tank next above Archbald.	S. 15° W.
On the "Old Plank" road above Archbald, about 600 feet north of the bridge of the Gravity R. R. over the river. On west side of the stream.	S. 14° W. S. 18° W.
Hill side, about 700 feet north of the last named point.	S. 30° W.

BEARING.

S. 18° W.
S. 20° W.
S. 22° W.
S. 28° W. In the lumber road, upon the terrace, about 2000 feet north of the Gravity R. R. bridge above Archbald. These striæ are within a few feet of each other.

S. 23° W.
S. 26° W.
S. 28° W.
S. 30° W. Various points upon the last mentioned terrace.

S. 34° W. The road leading from Jermyn toward the Callender Gap is crossed by a stream just north of the great pot holes. A road leads north-west up this stream and crosses the mountain. When the ledge of Pottsville conglomerate is crossed the striæ bear S. 34° W.

S. 30° W. 300 feet down the road from the last.

S. 23° W. About 800 feet above the watering trough on the Brown Hollow turnpike between Peckville and Callender Gap, a road leads west up the mountain side to a quarry of salmon-colored stone in the ledge of Pottsville conglomerate. At this quarry the striæ bear S. 23° W.

S. 55° W. About 1000 feet down this road, east of the quarry.

Two streams unite at the head of the reservoir on White Oak Run. Between these streams and 400 feet east of their junction striæ are exposed upon the conglomerate. The observations seem to be erroneous. I have them S. 20′ E. and S. 40° E. The E. should probably be W.

STRIÆ IN THE VICINITY OF JERMYN.

S. 15° W. On the ledge of Pottsville conglomerate, N. E. of Rushbrook and 3000 feet N. of the small breaker in the Rushbrook hollow.

S. 26° W.
S. 28° W.
S. 35° W. Top of the conglomerate ledge near the above point.

S. 10° W. Conglomerate out-crop on the west side of and near Rushbrook, at the lowest exposure of the ledge.

S. 34° W. Conglomerate ledge at the top of the mountain, due N.W. of the Jermyn store.

S. 15° W. On the back road from Jermyn toward Olyphant, at the brow of the principal hill.

S. 30° W. On the lumber road, leading from the back road near the last mentioned point S. E. toward Archbald, and 600 feet E. of the back road.

S. 25° W. About 400 feet south of the last.

STRIÆ IN THE VICINITY OF CARBONDALE.	BEARING.
Top of the conglomerate ledge, north of the bridge over Fall Brook, just above the saw-mill, and about 2000 feet north of High Fall.	S. 48° 30′ W.
1450 feet N.W. of the Midland Fan, on top of the hill.	S. 30° W.
From where the wagon road leading to the Chestnut Hill breaker crosses the light track of the Gravity R. R., about 550 feet N. E. and up the track.	S. 22° 30′ W.
On the hill top east of Carbondale and 2200 feet south of the plane at Racket Brook.	S. 23° W.
Conglomerate ledge, 3500 feet, S. 26° 30′ W., from where the South Canaan road crosses the first hill top S. E. of Carbondale.	S. 22° W.
Fork of the Milford and Owego turnpike with the Carbondale and Dundaff road.	S. 22° 30′ W.
On the road passing Williams's breaker (four miles north of Carbondale), about 1650 feet north of the breaker.	S. 22° W.
Where the Greenfield road crosses the conglomerate ledge.	S. 20° W.
Going up the Greenfield road from Carbondale, at the first place where the conglomerate ledge is seen, near the roadside, on the left and near a house.	S. 43° W.
On conglomerate ledge, about 1200 feet S.W. of the last mentioned locality.	S. 20° W.
Various exposures on the conglomerate and Pocono mountain tops west of Carbondale. Some of these bearings appear to one on the ground to be due to the local influences of topographical irregularities.	S. S. 12° W. S. 20° W. S. 25° W. S. 26° W. S. 30° W. S. 20° E.
STRIÆ IN THE VICINITY OF ELK MOUNTAIN.	
On the brow of the hill, facing north, between Dundaff and Elk mountain.	S. 24° W.
Elk mountain, south knob, on the Prospect Rock, east side.	S. 70-72° W.
Same locality, but west side of mountain.	S. 60° W. S. 65° W.
Top of the north knob of Elk mountain.*	S. 34° W.

*See *American Journal of Science*, Nov., 1886, pp. 362-366: The Thickness of the Ice in N. E. Pa. during the Glacial Epoch, by John C. Branner.

BEARING.

STRIÆ IN THE VICINITY OF MOCANAQUA.

S.
S. 10° W.
S. 20° W.
S. 40° W. Beside the track of the railway, 100—150 feet above where it passes through the cut in the conglomerate ledge above Mocanaqua. This observation, in connection with others below Nanticoke, within the valley, is important, as showing that the valley of the Susquehanna was formed before the glacial epoch.

S. 10° E. On the high conglomerate ledge, 300 feet S. E. of the engine house of the West End breaker.

S. 80° W. About three-quarters of a mile below Mocanaqua, at the fork of the Mountain Inn road.

W. On the Mountain Inn road, about 1200 feet above where it crosses Turtle Run.

S. 85° W. About 850 feet up the road, beyond the last mentioned.

W.
W.
S. 60° W. These observations are all beside the Mountain Inn road from where the colliery road turns off, just below Teasdale City, to about 2000 feet below this fork.

S. 60° W. On road leading from Mountain Inn road near Teasdale City to the East End breaker, 150 feet north of Mountain Inn road, and near the top of the ledge.

S. 50° E. (?)
S. 60° W.
S. 78° W.
S. 50° W.
S. 65° W.
S. 75° W. Observations in the vicinity of Teasdale City, but which cannot be satisfactorily located by a verbal description. Some of the points are located by the surveys of the Susquehanna Coal Company, and others by my own survey for the State Geological Survey.

S. 25° W. Where the Newport road from Mocanaqua, about three-quarters of a mile above the drift to which the railway from West End runs, passes through a gap in the ridge.

S. 60° W. Due north of last mentioned point, on the conglomerate ledge.

S. 60° W. About 50 feet N. E. of last point and on the same ledge.

S. 40° W. From last mentioned, 1300 feet further N. E. and on ledge.

S. 65° W. From last mentioned point, 300 feet N. E. and on ledge.

S. 50° W. About 2000 feet east of Whip-Poor-Will Hollow.

S. 15° W.
S. 15° E. Hill top N. E. of West End breaker.

S. 30° E.
S. 25° E.
S. On the hill, east and a little south of West End breaker.

S. 45° W. S. 65° W. W.

STRIÆ IN VARIOUS SCATTERED LOCALITIES.	BEARING.
At Askam Post Office, Luzerne County, where the stream crosses the road, and 200 feet east of the Post Office.	S. 67° 30′ W.
The following observations made near Wilkes-Barre were kindly furnished me by Sheldon Reynolds, Esq., Corresponding Secretary of the Wyoming Historical and Geological Society of Wilkes-Barre :—	
One-quarter of a mile beyond the N. E. boundary line of the city, on western face of foot-hill.	S. 49° W.
Half a mile N. E. of last described.	S. 52° W.
For the following observations I am indebted to Mr. George M. Lehman.	
Conyngham colliery.	S. 60° W.
On Gardner's Creek, near foot of mountain.	S. 45° E.
The following, also made by Mr. Lehman, are very interesting as showing the difference in the course of the ice at two very different elevations. They are all in the vicinity of the Nanticoke Gap.	
Near the old supply store of the Susquehanna Coal Company, Nanticoke.	N. 70° W.
On conglomerate, north of the river at Nanticoke and near the railway.	N. 80° W. W. N. 80° W.
The preceding are upon the low ground and are in marked contrast with these, which are all upon the summit of the conglomerate ledge west of Nanticoke and within a mile of the end next the river.	S. 5° E. S. 8° E. S. 10° E. S. 10° E. S. 12° E. S. 20° E.
Taylorville station, on D., L. & W. R. R. In the rear of the building. Two sets of striæ.	S. 73–80° W. S. 54° W.
Above the Salem breaker at Shickshinny.	S. 12° W.
At Schickshinny, on the narrow gauge railway, leading from the head of the plane above the Salem breaker toward the drifts, and about 1000 feet south of the curve, where it passes around the conglomerate ledge.	S. 55° W.
About 400 feet from above mentioned sharp curve.	S. 20° W.

A PRELIMINARY LIST

OF

THE VASCULAR PLANTS

OF THE

LACKAWANNA AND WYOMING VALLEYS.

COMPILED BY

WILLIAM R. DUDLEY,

CORNELL UNIVERSITY

INTRODUCTION.

This list is preparatory to the systematic work of exploration, of collecting and preserving specimens of the living plants of the entire region, which is contemplated by the botanists of the Lackawanna Institute. Using this as a basis, something that approaches a complete *flora* of the two valleys may be gradually elaborated; but several years of active work on the part of all the botanical members must elapse before such a catalogue would be sufficiently complete for publication.

The writer was a guest of the members of the Institute during a part of the session of their summer class in geology under Professor BRANNER in June, 1886; and at their suggestion, but unfortunately only a short time before his departure, he planned this paper. To make it in some sense worthy of its object he extended his researches for several additional days to certain parts of the adjacent plateau known as "The Pocono," and in the autumn visited many parts of the Wyoming Valley and the lower Lackawanna Valley; he also sought to bring together all the facts possible to obtain from others. This list, therefore, incomplete though it is even in respect to common plants, is based on information from several sources:—

First—A collection of herbarium specimens, chiefly from these valleys, made by Mr. R. N. DAVIS, of the Archbald High School, to which were added some notes of observations, which were prepared with much care, and with an evident sense of the scientific value of accuracy of statement. His collection contained over two hundred named species of flowering plants and ferns, beside quite a number of unnamed

but interesting species. The work of Mr. DAVIS has been of great service, and I have often given his name a place on the following pages, because of the indisputable evidence his specimens afforded me.

Second—Notes of observations which were generously sent me by Professor THOMAS C. PORTER, of Lafayette College, Easton, Pa., who is the best authority on the plants of his State. Besides his "Sketch of the Botany of Pennsylvania," published in *Gray's Atlas, 1872*, he forwarded selections from lists of plants observed on "The Pocono" and elsewhere in 1881 and 1884, also other notes of much value. In return I hope the botanists of the "Northern Anthracite Coal Valley" may be able to aid him essentially in the preparation of his forthcoming *Flora of Pennsylvania.*

Third—Lists of plants observed by Mrs. BEEBER and Mrs. BUELL, of Scranton, and Miss BANNISTER, of the Wyoming Seminary at Kingston, were placed in my hands, although they had no collections of pressed plants.

Fourth—The present Director of the Arkansas Geological Survey, Professor JOHN C. BRANNER, who is the authority on the topography of these valleys, gave me many valuable hints as to interesting localities, and accompanied me on several excursions.

Fifth—I have had my own collections and observations made during a week's stay in Scranton and on the Pocono in June, 1886; also in the exploration in the Wyoming Valley in the autumn. Quite full notes were taken down at the time, and the more interesting plants preserved in my herbarium.

The plan of the catalogue is as follows:—(1) All references to localities are for the Lackawanna and Wyoming Valleys and the mountains immediately bounding them. Because of their interest and proximity those plants we know to occur on the Elk Mountain (the highest point in N. E. Pennsylvania), and those at Tobyhanna, Gouldsboro, Lehigh Pond (near Gouldsboro and the source of one branch of the Lehigh River), Moosic Lake and other places on the neighboring Pocono plateau are included. "Common" means common over the areas of the valleys. (2) If a species is apparently

BOULDER ON THE SUMMIT OF BALD MOUNT.

rare, or if it has not been observed in more than two or three stations, the stations are recorded. Otherwise "common," "frequent" or other expressions to indicate abundance are used. (3) All statements of localities, for a species or of its abundance, *not* followed by any name of a person, are based on the writer's own observations or collections. (4) If the name of a person follows any statement in the same sentence with it, it indicates that such person alone is authority for the statement. (5) References are frequently made to specimens in collections because such evidence is of the first importance. I would strongly urge every botanist of the valley to hereafter press all plants collected (certainly all those which are supposed to be at all rare), and place duplicates of them in the general herbarium of the Institute, for the use of future workers on the geographical distribution of species.

Geologically the Lackawanna and Wyoming form one long, closed valley, and its mountain-walls gradually coalesce at each end to become a single range. Because of the southeastern curvature of both of these ranges,—the Moosic on the southeast and the Lackawanna on the northwest,—it presents, on the map, almost the form of a crescent. Through the walls of Lackawanna Mountain the Susquehanna River has broken, and passes into the valley at Campbell's Ledge; then out of it, skirting the precipitous base of the River Mountain; then quite across the valley at Mocanaqua, and out again. This affords bold cliffs near a river, always favorite haunts of rare plants. Campbell's Ledge, above Pittston, at the upper gateway of the Susquehanna, rises abruptly 750 feet above the river, and over 1300 feet above tide. We find the Walking Leaf Fern and the Cliff Brake (*Pellæa atropurpurea*) on its summit, together with a rare flax (*Linum sulcatum*), and a still rarer grass (*Kœleria cristata*). The latter also occurs on the River Mountains. Several miles northeastward from Campbell's Ledge occurs the highest point of the Lackawanna range—Bald Mountain. It is easily reached by a good mountain-road from Scranton, and has an elevation of 2385 feet above tide. On its bold parapets of conglomerate

grow the rare fern *Asplenium montanum* and one plant known nowhere else in the State, viz.: *Potentilla tridentata.* East and southeast of Scranton the Moosic range rises gradually into and partly coalesces with the broad plateau—the Pocono Mountain, which sweeps away to the east, northeast and southeast with a general elevation in this region of from 1800 to 2100 feet. This is naturally a wilderness area, much of it rocky or barren, and in it occur numerous swamps, peat-bogs and cold mountain ponds, which are sources of the brooks which feed the Delaware, the Lehigh, the Lackawanna and the Susquehanna. Here occur occasional tracts—all too few at the present day—of the primeval forest, their dark, cool shades lighted up by the torches of Rhododendron flowers in June and July. I have particularly in mind Lehigh Pond, surrounded by a sphagnum bog, and a large tract of the virgin forest. In the cold sphagnum are the heaths, orchids and sedges of Labrador and Northern Europe, here almost on their southern limit. Such are: *Kalmia glauca*, *Ledum latifolium*, *Andromeda polifolia*, *Carex limosa*, *Carex Magellanica* and *Eriophorum vaginatum.* In the half-light of the forest bordering, on the crumbling trunks of fallen trees, under tall pines, spruces and fragrant balsams, spring the pink Oxalis, the odd Indian-cucumber, the Pappoose Flower (*Trillium erectum*) and dusky orchids like *Habenaria orbiculata*, *Habenaria Hookeri*, the Coral-root and the pink Moccasin-flower (*Cyprepedium acaule*). All of this is in delightful contrast with the areas outside, desolated by the axe and the saw, and now exhibiting only ghastly dead trunks, occasionally left standing, the bare rocks and intervening wastes covered chiefly by Red Raspberry and Blackberry bushes, the Wild Red Cherry and the Bristly Elder. In several localities in the ponds on the Moosic and Pocono, as well as in the valley, occurs *Orontium aquaticum* in abundance, supposed to be a coast plant, but extending, according to Professor PORTER, far into the Alleghenies, even 300 miles from the sea. At the head of Little Roaring Brook on the Moosic Mountain, near Tobyhanna on the Pocono, and probably elsewhere, occurs perhaps the most interesting species of

the *flora*. It is *Arcenthobium pusillum*, a little plant allied to the true Mistletoe, and hitherto not discovered outside of the State of New York. It is parasitic on the branches of the Black Spruce of the mountain swamps. It is a curious fact that it was not even known to science until 1871, when it was discovered by Miss L. A. MILLINGTON in Warren County, New York. Since then stations have been discovered in Essex, Renssalaer, Saratoga, Herkimer, Oswego, and Sullivan Counties of New York, last year by myself in Seneca County, New York, and Lackawanna and Monroe Counties in Pennsylvania. It may be looked for farther south, as the Black Spruce extends into North Carolina, and there is no reason to suppose it affects the North like so many of the plants about it. Nevertheless this plateau, in its undisturbed tracts, is remarkable for the predominance of northern plants, some of which find here their southern limits, some extend along the Alleghenies in a narrowing belt to their southern termination in North Carolina. In striking contrast to what has been mentioned above are the low, narrow valleys, 500 to 700 feet above tide, such as the lower part of the Lackawanna and the more alluvial Wyoming. The richer soil, the sheltered areas and the shores of a river afford an entirely different series of plants. The Cottonwood, the Silver Maple, the American Elm are frequent here, with occasional Black Walnuts. Here also, along the river banks, is a characteristic and picturesque tree, with a rich, salmon-colored bark—the River Birch (*Betula nigra*). It forms groves along the Susquehanna, and Everhart's Island, on the lower Lackawanna, is nearly covered with a fine growth of them. They have been noticed above Scranton to Peckville, but probably disappear with the changed character of the valley above Archbald. The Wild Yam is occasional in the Lackawanna and Wyoming Valleys, and where the Susquehanna breaks across at Mocanaqua, occurs *Dianthera*, a plant of the larger river and lake shores, conspicuous on the lower Susquehanna and the lower Juniata, but not known on the Delaware or its branches, or hitherto on the upper Susquehanna. Here also is *Physostegia Virginiana*, a handsome flowered western plant,

this station apparently being on its northeastern limit. It is rare in Pennsylvania, Professor PORTER reporting it on the Schuylkill below Norristown (its extreme eastern limit), and as sparingly on the lower Susquehanna. Near Mocanaqua occurs *Erysimum cheiranthoides*, hitherto regarded as peculiar to the Susquehanna below Harrisburg.

Outside the valley proper are localities of presumable interest to the botanist, because of their height and exposure; and they are near enough to be readily visited from Scranton, but it is doubtful whether they will yield as much that is of interest as the places already mentioned. Elk Mountain, ten miles northwest of Carbondale, has two peaks, the South Knob, 2575 feet, the North Knob, 2700 feet above tide. A single visit to this mountain in June revealed but few rare plants. *Panicum xanthophysum*, between the knobs, may be justly called so. It is not reported south of Luzerne County, and occurs but sparingly from Massachusetts to Minnesota. Sixteen miles north of Carbondale are Ararat Peak, 2600 feet, and Sugar Loaf, 2450 feet above tide. These have not been visited by myself.

The illustrations given indicate that our limits include many rare plants and a very great variety of soil and habitat; and yet it will be seen that explorations have been both hasty and incomplete. The promise is clearly great for the discovery of as interesting forms as any yet found, and there is, therefore, every incentive to this fascinating work for those who can carry it forward. Let everyone interested make it a point to press the plants secured, even the common ones; and let duplicates of each species, accompanied by a label giving exact date and locality,—even if the name be omitted,—be placed in the hands of a curator appointed by the Institute. From these labels a slip catalogue could be easily made and kept by the curator, and he could direct future searches for plants which ought to occur within limits, but which have not been secured. In doing this it would be wise to assign particular orders of plants to individuals and make each responsible for work done in collecting the species belonging to such orders. Let each specimen pressed be as

complete in regard to flowers, fruit, leaves, rootstock, bulb, and even roots in the case of herbs, as it is possible to make it, and let the specimen be cared for while in press so that its colors shall come out as bright and as natural as it is possible to make them. The more specimens one has when he attempts to work up a collection, the better. With such co-operation and care results can be accomplished which may be of much use to science.

BOTANICAL LABORATORY,
Cornell University, June 1, 1887.

PHÆNOGAMIA, OR FLOWERING PLANTS.

RANUNCULACEÆ.

1. **Clematis verticillaris,** DC. PURPLE CLEMATIS.
   Elk Mountain, about "Prospect Rock."

2. **C. Virginiana,** L. WHITE CLEMATIS. VIRGIN'S BOWER.
   Abundant. (*In herbarium of R. N. Davis.*)

3. **Anemone Virginiana,** L. VIRGINIAN ANEMONE.
   Frequent.

4. **A. dichotoma,** L. (*A. Pennsylvanica,* L., Gray's Manual, p. 37.)
   Wilkes-Barre, near river. Near Kingston, (*Miss A. Bannister.*)

5. **A. nemorosa,** L. WIND-FLOWER. WOOD-ANEMONE.
   Common, (*R. N. D., in herb.*)

6. **A. Hepatica,** L. (*Hepatica triloba,* Chaix., Man., p. 38.) HEPATICA.
   Dry woods about the Lackawanna and Wyoming Valleys.

7. **A. acutiloba,** Lawson. (*Hepatica acutiloba,* DC., Man. p. 38.) HEPATICA.
   (*In herb. R. N. D.*)

8. **Anemonella thalictroides,** Spach. (*Thalictrum anemonoides,* Michx., Man. p. 38.) RUE-ANEMONE.
   Common, (*R. N. D. in herb.*)

9. **Thalictrum polygamum,** L. (*T. Cornuti,* L., Man. p. 39.) TALL MEADOW-RUE.
Swamp near Wyoming.

10. **T. purpurascens,** L., **var. ceriferum,** Austin.
Mountain south of Wilkes-Barre, (*in herb. W. K. D.*)

11. **Ranunculus aquatilis,** L., **var. trichophyllus,** Chaix. WHITE WATER-CROWFOOT.
In a stream above Gouldsboro.

12. **R. abortivus,** L. SMALL-FLOWERED CROWFOOT.
Frequent, (*R. N. D. in herb.*)

13. **R. recurvatus,** Poir.
Woods near Dunmore.

14. **R. Pennsylvanicus,** L.
Common, (*R. N. D. in herb.*)

15. **R. fascicularis,** Muhl. EARLY CROWFOOT.
Common, (*R. N. D. in herb.*)

16. **R. septentrionalis,** Poir. (The *R. repens* of Gray's Man. only in part. The true *R. repens,* L., is a lower, slenderer plant, more freely rooting from its runners than the above, and often appears as if introduced.)
Plainsville, (*in herb. R. N. D.*)

17. **R. acris,** L. BUTTERCUP.
Common, (*R. N. D. in herb.*)

18. **Caltha palustris,** L. MARSH-MARIGOLD.
Stafford Meadow Brook, near Scranton. (*Mrs. Buell.*)
Near R. R. above Gouldsboro.

19. **Caltha palustris, L., var. Sibirica,** is in Monroe County. (*Professor Porter.*)

20. **Coptis trifolia,** Salisb. GOLD THREAD.
Swamp at the head of Little Roaring Brook.

21. **Aquilegia Canadensis,** L. COLUMBINE.
Common in rocky places.

22. **Cimicifuga racemosa,** Ell. BLACK SNAKE-ROOT.
Campbell's Ledge. Abundant along the Mountain Inn road and elsewhere about the Wyoming Valley. (*In herb. W. R. D.*)

MAGNOLIACEÆ.

23. **Magnolia acuminata,** L. CUCUMBER TREE.
It is said to occur near Waverly, Pa.

24. **Liriodendron Tulipifera,** L. WHITE-WOOD. TULIP-TREE.
Abundant in Lackawanna and Wyoming Valleys. (*In herb. R. N. D.*)

MENISPERMACEÆ.

25. **Menispermum Canadense,** L. MOON-SEED VINE.
Near Kingston.

BERBERIDACEÆ.

26. **Podophyllum peltatum,** L. MANDRAKE.
Common, (*R. N. D. in herb.*) Mountain Inn road.

NYMPHÆACEÆ.

27. **Nymphæa odorata,** Ait. WHITE POND-LILY.
In the ponds on the hills near Crystal Lake.

28. **Nuphar advena,** Ait. YELLOW POND-LILY.
Still water above and below Scranton and near Wyoming.

29. **N. pumilum,** Smith.
Tobyhanna Mills. (*1881, Professor T. C. Porter.*)

SARRACENIACEÆ.

30. **Sarracenia purpurea,** L. PITCHER-PLANT.
Formerly near the Scranton Court-house. (*Mrs. Beeber.*)
Swamp at the head of Little Roaring Brook. Moosic Lake.

PAPAVERACEÆ.

31. **Chelidonium majus**, L. CELANDINE.
Near Scranton, (*Mrs. Buell.*) Near Kingston, (*Miss Bannister.*)

32. **Sanguinaria Canadensis**, L. BLOOD-ROOT.
Near Scranton, (*Mrs. Buell.*)

FUMARIACEÆ.

33. **Adlumia cirrhosa**, Raf. ALLEGHENY VINE.
Rocks by R. R. above Mocanaqua. Lynn, (*in herb. R. N. D.*)

34. **Dicentra Cucullaria**, DC. DUTCHMAN'S BREECHES.
Near Hyde Park, (*Mrs. Buell.*) Toby's Eddy (?), (*R. N. D.*)

35. **D. Canadensis**, DC. SQUIRREL CORN.
Reported by Mrs Buell and by Mr. Davis.

36. **Corydalis glauca**, Pursh.
Rocks, etc., in Lackawanna and Wyoming Valleys. (*In herb. W. R. D.* and *R. N. D.*)

CRUCIFERÆ.

37. **Cardamine rhomboidea**, DC.
Woods near Gouldsboro.

38. **C. hirsuta**, L.
Lower Lackawanna Valley.

39. **C. hirsuta**, L., **var. sylvatica**, Gr.
On rocks on the River Mountains above Mocanaqua, (*Herb. W. R. D.*)

40. **Arabis lyrata**, L.
Elk Mountain. Bald Mountain. Campbell's Ledge. River Mountains. (*Herb. W. R. D.*)

41. **A. hirsuta**, Scop.
Sandstone ledge north of Taylorville.

42. **A. Canadensis**, L. SICKLE-POD.
Lower Lackawanna Valley.

43. **Erysimum Cheiranthoides**, L.
Near the Susquehanna below Mocanaqua. (Not reported before from this part of the State. It occurs on the lower Susquehanna according to Professor Porter.)

44. **Barbarea vulgaris**, R. Br. WINTER CRESS.
Common, (*R. N. D. in herb.*)

45. **Sisymbrium officinale**, Scop. HEDGE MUSTARD.
Scranton. Common, (*R. N. D. in herb.*)

46. **Brassica Sinapistrum**, Boiss. WILD MUSTARD.
Near Scranton, (*Mrs. Buell.*) Near Crystal Lake.

47. **B. nigra**, Gray. BLACK MUSTARD.
Common, (*R. N. D. in herb.*)

48. **Nasturtium officinale**, R. Br. WATER CRESS.
Roaring Brook, (*Mrs. Buell.*) Common, (*R. N. D. in herb.*)

49. **N. palustre**, DC.
Common, (*R. N. D. in herb.*)

50. **Capsella Bursa-pastoris**, Mænch. SHEPHERD'S PURSE.
Common, (*R. N. D. in herb.*)

51. **Lepidium Virginicum**, L. PEPPER-GRASS.
Common, (*R. N. D. in herb.*)

52. **L. ruderale**, L.
Wilkes-Barre and Scranton.

CAPPARIDACEÆ.

53. **Polanisia graveolens**, Raf.
Susquehanna River, near the Lackawanna and Bloomsburg Junction.

CISTACEÆ.

54. **Helianthemum Canadense**, Michx. ROCK-ROSE.
Campbell's Ledge, (*in herb. W. R. D.*) Near pond below Lackawanna Station.

55. **Lechea thymifolia**, Pursh. PINWEED.
Common, (*in herb. W. R. D.*)

56. **L. minor**, Lam.
Mountain Inn road, (*in herb. W. R. D.*)

VIOLACEÆ.

57. **Viola rotundifolia**, Michx. SWEET YELLOW VIOLET.
Common, (*R. N. D. in herb.*)

58. **V. blanda**, L. WHITE VIOLET.
Common, (*R. N. D. in herb.*)

59. **V. palmata**, L. (*V. cucullata, Ait., var. palmata*, Gr. Man. p. 78.)
Back of Plainsville, (*R. N. D. in herb.*)

60. **V. palmata**, L., **var. cucullata**, Gr. (*V. cucullata*, Ait., Man. p. 78.)
Common, (*R. N. D. in herb.*)

61. **V. Sagittata**, Ait. ARROW-LEAVED VIOLET.
Common in both valleys. (*In herb. R. N. D.*)

62. **V. canina**, L., **variety Muhlenbergii**, Gray. (*V. canina*, L., *var. sylvestres*, Reg.)
Common, (*R. N. D. in herb.*)

63. **V. rostrata**, Pursh. LONG-SPURRED VIOLET.

64. **V. Canadensis**, L.
Common, (*R. N. D. in herb.*)

65. **V. pubescens**, Ait. DOWNY YELLOW VIOLET.
Common, (*R. N. D. in herb.*)

66. **V. lanceolata,** L.
Near the canal at Plainsville, (*in herb. R. N. D.*)

POLYGALACÆ.

67. **Polygala verticillata,** L.
Near Wilkes-Barre.

68. **P. ambigua,** Nutl.
On ledges of "red shale" above Mocanaqua, (*In herb. W. R. D.*)

69. **P. sanguinea,** L.
"Fields back of Plainsville," (*R. N. D. in herb.*)

70. **P. paucifolia,** Wild. FRINGED POLYGALA. INDIAN PINK.
Common, (*R. N. D. in herb.*)

CARYOPHYLLACEÆ.

71. **Saponaria officinalis,** L.
Common, (*R. N. D. in herb.*)

72. **Silene stellata,** Ait. STARRY CAMPION.
Along the west bank of the lower Lackawanna valley, (*in herb. W. R. D.*)

73. **S. antirrhina,** L. SLEEPY CATCHFLY.
Ledges and dry soil, Campbell's Ledge, etc., (*in herb. W. R. D.*)

74. **Lychnis Githago,** Lam. CORN COCKLE.
In cultivated fields, (*R. N. D. in herb.*)

75. **Cerastium viscosum,** L. MOUSE-EAR CHICKWEED.
Common, (*R. N. D. in herb.*)

76. **Stellaria Media,** Sm. CHICKWEED.
Common.

77. **S. borealis,** Bigel.
Elk Mountain. (Also sent, with *Stellaria ulegenosa*, to Professor Porter, from Wayne County, by John M. Dolph.)

78. **Arenaria serpyllifolia,** L. SANDWORT.
Wilkes-Barre, etc.

79. **Spergula arvensis,** L. CORN-SPURREY.
Above Carbondale.

PORTULACACEÆ.

80. **Portulaca oleracea,** L. PURSLANE.
Common.

81. **Claytonia Virginica,** L. SPRING BEAUTY.
Near Scranton, (*Mrs. Buell.*)

82. **C. Caroliniana,** Michx. SPRING BEAUTY.
Common, (*R. N. D.*)

HYPERICACEÆ.

83. **Hypericum Ellipticum,** Hook. Tobyhanna Mills, (*1831, Prof. Porter.*)

84. **H. perforatum,** L. COMMON ST. JOHN'S WORT.
Common, (*R. N. D. in herb.*)

85. **H. maculatum,** Walter, (*H. corymbosum,* Muhl. Man. p. 85.)
(*In herb. R. N. D,*) "probably from the two valleys."

86. **H. mutilum,** L.
Abundant near Wilkes-Barre, Scranton, and Crystal Lake.

87. **H. Canadense,** L.
Pocono Station, on D., L. & W. R. R., (*1881, Prof. Porter.*)

88. **H. Sarothra,** Michx. PINE-WEED.
Dry fields south of Wilkes-Barre.

89. **Elodea campanulata,** Pursh. (*Elodes Virginica,* Nutt. Man. p. 86.)
Near pond in the lower Lackawanna Valley. Lehigh Pond. Near Gouldsboro.

MALVACEÆ.

90. **Malva rotundifolia,** L. COMMON MALLOW.
Common, (*R. N. D. in herb.*)

91. **Abutilon Avicennæ,** Gærtn. VELVET-LEAF.
Wilkes-Barre. Wyoming.

TILIACEÆ.

92. **Tilia Americana,** L.
Everywhere abundant.

LINACEÆ.

93. **Linum Virginianum,** L.
Campbell's Ledge. Red-shale ledges above Mocanaqua, etc.

94. **L. sulcatum,** Ridd.
Top of Campbell's Ledge, (*in herb. W. R. D.*)
This rare plant is reported from Pennsylvania only from two or three other localities, (*Prof. Porter.*)

GERANIACEÆ.

95. **Geranium maculatum,** L. WILD CRANES-BILL.
Common.

96. **G. Carolinianum,** L.
South of Plainsville Brick-church, (*R. N. D. in herb*). Near Kingston, (*Miss Bannister.*)

97. **G. Robertianum,** L. HERB ROBERT.
Near Scranton, (*Mrs. Bucll.*)

98. **Impatiens pallida,** Nutt. PALE TOUCH-ME-NOT.
Woods across the river from Wilkes-Barre.

99. **I. fulva,** Nutt.
Common. (*In herb R. N. D.*)

100. **Oxalis acetosella,** L.
White Oak ravine near Archbald, (*R. N. D. in herb*).
Near the Archbald "pot-hole."

101. **O. stricta,** L. YELLOW WOOD-SORREL.
Common. (*In herb R. N. D.*)

SIMARUBACEÆ.

102. **Ailanthus glandulosus,** Desf. AILANTHUS.
Escaped, near the S. H. below Lackawanna Station.

ILICINEÆ.

[AQUIFOLIACEÆ of Gray's Man., p. 305.]

103. **Ilex verticillata,** Gray. WINTER-BERRY. BLACK ALDER.
Swamps on the mountains and in the valley.

104. **I. lævigata,** Gray.
Swamp at head of little Roaring Brook. Lehigh Pond, (*Herb. W. R. D.*) Before reported from Lancaster County, and Broad Mountain, Schuylkill County, (*Prof. Porter.*)

105. **I. monticola,** Gray.
Elk Mountain, (*herb. W. R. D.*) South-east of Dunmore (?)

106. **I. mollis,** Gray.
Apparently this species, from R. N. D., Dec., 1886;—fruit and old leaves only, from near the railroad above Archbald.

107. **Nemopanthes Canadensis,** DC. MOUNTAIN HOLLY.
Swamp at the head of Little Roaring Brook.

CELASTRACEÆ.

108. **Celastrus scandens**, L. BITTER SWEET.
Occasional, (*R. N. D. in herb.*) Campbell's Ledge, etc.

RHAMNACEÆ.

109. **Ceanothus Americanus**, L. JERSEY TEA.
Common in dry rocky woods.

VITACEÆ.

110. **Vitis Labrusca**, L. FOX OR SWAMP GRAPE.
By streams, south of Wilkes-Barre. Lower Lackawanna Valley.

111. **V. æstivalis**, Michx. SWEET FROST-GRAPE.
Frequent.

112. **V. riparia**, Michx. (*V. cordifolia* of Gray's Man. p. 112, in part.)
Flats opposite Wilkes-Barre.

113. **Ampelopsis quinquefolia**, Michx. VIRGINIA CREEPER.
Common. (*In herb. R. N. D.*)

SAPINDACEÆ.

114. **Æsculus Hippocastanum**, L. HORSE-CHESTNUT.
Rarely escaping. (*R. N. D. in herb.*)

115. **Acer Pennsylvanicum**, L. STRIPED MAPLE.
Elk Hills. Bald Mount. Frequent toward Shickshinny.

116. **A. spicatum**, Lam. MOUNTAIN MAPLE.
Bald Mount.

117. **A. saccharinum**, Wang. SUGAR MAPLE.
Frequent.

118. **A. dasycarpum**, Ehrhart. SILVER MAPLE.
Banks of the Susquehanna River opposite Wilkes-Barre.

119. **A. rubrum**, L.
Common.

ANACARDIACEÆ.

120. **Rhus typhina**, L. STAGS-HORN SUMAC.
Common.

121. **R. glabra**, L. SMOOTH SUMAC.
Common.

122. **R. venenata**, DC.
Swamp above Gouldsboro.

123. **R. Toxicodendron**, L. POISON IVY. POISON OAK.
Common.

124. **R. copallina**, L.
Frequent, near Scranton, Wilkes-Barre, Wanamie, etc.

LEGUMINOSÆ.

125. **Baptisia tinctoria**, R. Br. WILD INDIGO.
Everywhere abundant in dry woods. In herbarium.

126. **Lupinus perennis**, L. LUPINE.
North of Dunmore. Common, (*R. N. D. in herb.*)

127. **Medicago lupulina**, L. BLACK MEDIC.
Near Scranton. (?)

128. **Trifolium pratense**, L. RED CLOVER.
Common.

129. **T. repens**, L. WHITE CLOVER.
Common.

130. **T. agrarium**, L. YELLOW CLOVER.
Common, (*R. N.D. in herb.*) Near Waymart.

131. **Tephrosia Virginiana,** Pers. HOARY PEA.
Northeast of Dunmore. Campbell's Ledge, frequent. Red shales above Mocanaqua.

132. **Robinia Pseudacacia,** L. LOCUST-TREE.
Near Scranton. Rarely escaping, (*R. N. D. in herb.*).
At Locust Ridge, six miles southwest of Tobyhanna Mills, where it is certainly indigenous, (*Prof. Porter.*)

133. **Desmodium nudiflorum,** DC.
South of Wilkes-Barre. The small form with scattered leaves in the woods of Campbell's Ledge. (*In herb. W. R. D.*)

134. **D. acuminatum,** DC.
Near Wilkes-Barre and Shickshinny in mountain woods.

135. **D. rotundifolium,** DC.
On the red shale ledges above Mocanaqua.

136. **D. canescens,** DC.
Near Wyoming, (*in herb. W. R. D.*) Red shale ledges, Mocanaqua.

137. **D. cuspidatum,** Torr. and Gray.
Campbell's Ledge. Red shales near Mocanaqua.

138. **D. Dillenii,** Darlingt.
Red shale ledges above Mocanaqua.

139. **D. paniculatum,** DC.
Frequent.

140. **D. Canadense,** DC.
Not common. Above Pittston. Red shales above Mocanaqua.

141. **D. rigidum,** DC.
Red shales (*in herb. W. R. D.*) A rare plant in Pennsylvania, (*Prof. Porter.*)

142. **D. Marilandicum,** Boott.
Red shales. Campbell's Ledge.

143. **D. ciliare**, DC.
Campbell's Ledge, (*in herb. W. R. D.*)

144. **Lespedeza repens**, Bart.
Campbell's Ledge. The red shales. Southeast of Wilkes-Barre, (*in herb. W. R. D.*)

145. **L. violacea**, Pers.
Frequent in the lower Lackawanna Valley.

146. **L. hirta**, Ell.
Frequent.

147. **L. capitata**, Michx.
Near Wyoming. Lower Lackawanna Valley.

148. **Vicia Caroliniana**, Walt. WILD VETCH.
Mountain Inn road. Campbell's Ledge.

149. **V. Cracca**, L.
Tobyhanna Mills, 1881, (*Prof. Porter.*)

150. **Apios tuberosa**, Mœnch. GROUND-NUT.
Low grounds near Wyoming.

151. **Amphicarpæa monoica**, Nutt.
Frequent.

ROSACEÆ.

152. **Prunus Americana**, Marshall. WILD PLUM.
Throughout the lower Lackawanna Valley and Wyoming Valley. Two trees near Everhart's Island, each ten inches in diameter.

153. **P. avium**, L. ENGLISH BLACK CHERRY.
By Lackawanna road below Scranton.

154. **P. Pennsylvanica**, L. WILD RED CHERRY.
Frequent.

155. **P. Virginiana**, L.
Common.

156. **P. serotina,** Ehrh.
Common, especially in the valley woods.

157. **Spiræa salicifolia,** L. MEADOW-SWEET.
Abundant in the Lackawanna Valley. (*In herb. W. R. D.*)

158. **S. tomentosa,** L.
Very abundant about Carbondale. Fewer in the lower Lackawanna Valley and Wyoming Valley.

159. **Physocarpus opulifolius,** Maxim. (*Spiræa opulifolia* L., Man. p. 149.) NINEBARK.
Lower Lackawanna Valley, near old track of the Delaware, Lackawanna and Western Railroad. (*In herb. W. R. D.*)

160. **Gillenia trifoliata,** Mœnch.
Campbell's Ledge. Mountain Inn road, etc.

161. **Dalibarda repens,** L.
Swamp at the head of Little Roaring Brook. Near Lehigh pond. Peat bog above Gouldsboro by railroad.

162. **Rubus odoratus,** L. FLOWERING RASPBERRY.
Campbell's Ledge. Mocanaqua, etc. (*In herb. R. N. D.*)

163. **R. neglectus.** Pk. (See 22d Rep. to the Regents of N. Y., p. 23.)
Lower Lackawanna Valley, (*in herb. W. R. D.*) Also in herb. R. N. D.

164. **R. strigosus,** Michx. RED RASPBERRY.
Common, especially on the mountains. (*In herb. R. N. D.*)

165. **R. occidentalis,** L. BLACK-CAP RASPBERRY.
Frequent.

166. **R. villosus,** Ait. BLACKBERRY.
Common.

167. **R. Canadensis,** L. DEWBERRY.
Common.

168. **R. hispidus,** L. SWAMP BLACKBERRY.
Swamp at head of Little Roaring Brook.

169. **Geum album**, Gmelin.
Lower Lackawanna Valley.

169½. **G. strictum**, Ait.
Tobyhanna Mills, (*Prof. Porter.*)

170. **Waldsteinia fragarioides**, Willd. BARREN STRAWBERRY.
Near Scranton, (*Mrs. Buell*).

171. **Fragaria Virginiana**, Ehrh. WILD STRAWBERRY.
Common, (*R. N. D. in herb.*)

172. **F. vesca**, L. WOOD STRAWBERRY.
Common, (*R. N. D. in herb.*)

173. **Potentilla Norvegica**, L.
Common.

174. **P. Canadensis**, L. FIVE-FINGER.
Common.

175. **P. argentea**, L. SILVERY CINQUE-FOIL.
Campbell's Ledge. South of Wilkes-Barre. Also in Susquehanna County, (*Prof. Porter*).

176. **P. arguta**, Pursh.
Campbell's Ledge, (*in herb. W. R. D.*)
Rare in Pennsylvania. Only reported from the Susquehanna River below Harrisburg, and the Delaware River near Easton, (*Prof. Porter.*)

177. **P. palustris**, Scop. MARSH FIVE-FINGER.
Wyoming, abundant in the swamp. Lehigh Pond, (*in herb. W. R. D.*)
Previously reported from Pennsylvania only from one station in Pike County, (*Prof. Porter.*)

178. **P. tridentata**, Ait.
On the lookout ledges, on the summit of Bald Mountain, (*in herb. W. R. D.*)
Not before observed in the State, (*Prof. Porter.*) Before I secured it in 1886, the plants had attracted the attention of Pro-

fessor Branner, who recognized it as a species of the northern mountains. It also appears on the tops of the highest peaks in North Carolina.

179. **Agrimonia Eupatoria**, L. AGRIMONY.
Frequent.

180. **Rosa Carolina**, L. CAROLINA ROSE.
Not uncommon.

181. **R. humilis**, Marsh. (*R. lucida* of Gray's Man. p. 158, for most part.)
Frequent, especially in the mountain woods.

182. **R. setigera**, Michx. PRAIRIE ROSE.
By road north of Taylorville (a doubtful specimen).

183. **R. rubiginosa**, L. SWEET-BRIER.
Frequent.

184. **Pirus malus**, L. APPLE.
Wild in the lower Lackawanna Valley.

185. **P. coronaria**, L. WILD CRAB-APPLE.
Frequent in the Lackawanna and Wyoming Valleys. (*In herb. R. N. D.*)

186. **P. arbutifolia**, L. CHOKEBERRY.
Little Roaring Brook swamp. Pond near Waymart.

187. **P. Americana**, DC. MOUNTAIN ASH.
Bald Mountain.

188. **Crataegus oxycantha**, L. ENGLISH HAWTHORN.
Escaped to roadside, (several shrubs,) by road north of Dundaff.
Hitherto escaped in Pennsylvania only near Philadelphia, (*Prof. Porter.*)

189. **C. coccinea**, L. SCARLET THORN.
Frequent.

190. **C. coccinea, L. var. macracantha,** Dudley. (See *Cayuga Flora*, p. 33.)
South of Wilkes-Barre. Lower Lackawanna Valley.

191. **C. tomentosa,** L. BLACK THORN.
Lower Lackawanna Valley, etc.

192. **C. tomentosa,** L. **var. punctata,** Gray.
Near Wilkes-Barre. Mountain Inn road.

193. **C. crus-galli,** L. COCKSPUR THORN.
Southeast of Wilkes-Barre.

194. **Amelanchier Canadensis,** Torr. and Gray. JUNE-BERRY. SHAD-BUSH.
Common, (*R. N. D. in herb.*)

195. **A. Canadensis,** T. and Gr. **var. rotundifolia,** Gray.
Campbell's Ledge. Bald Mountain. Red shales, Mocanaqua.

SAXIFRAGACEÆ.

196. **Saxifraga Virginiensis,** Michx. EARLY SAXIFRAGE.
Rather common on rocks.

197. **Tiarella cordifolia,** L. FALSE MITRE-WORT.
Near Scranton, (*Mrs. Buell and Mrs. Beeber*).

198. **Mitella diphylla,** L. MITRE-WORT. BISHOP'S-CAP.
Frequent.

199. **M. nuda,** L.
Swamp on the Pocono Mountain northeast of Tobyhanna. Rare in Pennsylvania (*Prof. Porter*).

200. **Chrysosplenium Americanum,** Schw. GOLDEN SAXIFRAGE.
Spring brooks near Archbald "pot holes."

201. **Ribes cynosbati,** L. PRICKLY GOOSEBERRY.
Elk Hills. A few on the sandstone ledge above Taylorville.

202. **R. rotundifolium,** Michx.
Campbell's Ledge cliffs.

203. **R. prostratum,** L'Her. FETID CURRANT.
Swamp above Gouldsboro.

204. **R. floridum,** L. BLACK CURRANT.
Plainsville, (*R. N. D. in herb.*) Below Scranton.

205. **R. rubrum,** L. RED GARDEN-CURRANT.
Rare as a scape, (*in herb. R. N. D.*)

206. **Hydrangea arborescens,** L. WILD HYDRANGEA.
Near Scranton, (*Mrs. Buell*). Lower Lackawanna Valley, (*in herb. W. R. D.*) Campbell's Ledge. Mountain ravines of the Wyoming Valley.

CRASSULACEÆ.

207. **Penthorum sedoides,** L. DITCH STONE-CROP.
Common.

208. **Sedum Telephium,** L. LIVE-FOR-EVER.
Below Wilkes-Barre and east of Wyoming.

DROSERACEÆ.

209. **Drosera rotundifolia,** L. ROUND-LEAVED SUNDEW.
On Moosic Mountain. Near Moosic Lake.

210. **D. intermedia,** Dr. and Hayne. **Var. Americana,** DC.
In the bog about Lehigh Pond.

HAMAMELACEÆ.

211. **Hamamelis Virginiana,** L. WITCH-HAZEL.
Common.

ONAGRACEÆ.

212. **Epilobium Angustifolium,** L. FIRE-WEED.
Common.

213. **E. palustre, L. var. lineare, Gray.**
Swamp at the head of Little Roaring Brook.

214. **E. coloratum, Muhl.**
Frequent.

215. **Ludwigia palustris, Ell.** FALSE LOOSESTRIFE.
Wyoming swamp.

216. **L. alternifolia, L.**
Gravelly shores of the Susquehanna. Southeast of Mocanaqua, (*in herb. W. R. D.*)

217. **Œnothera biennis, L.** EVENING PRIMROSE.
Frequent.

218. **Œ. pumila, L.**
Toward Crystal Lake. "Common near Plainsville," (*R. N. D. in herb.*)

219. **Œ. fruticosa, L.**
Below Campbell's Ledge, (*R. N. D. in herb.*) Near top of Bald Mountain, (*in herb. W. R. D.*)

220. **Gaura biennis, L.**
Near Kingston. Also by Miss Bannister.

221. **Circæa Lutetiana, L.** ENCHANTER'S NIGHTSHADE.
Frequent.

222. **C. alpina, L.**
Swamp near the Mountain Inn; also on top of the River Mountains.

CUCURBITACEÆ.

223. **Sicyos angulatus, L.** STAR CUCUMBER.
Waste places in Wilkes-Barre, and the lower Lackawanna Valley.

FICOIDEÆ.

224. **Mollugo verticillata, L.** CARPET-WEED.
Frequent about Scranton and Wilkes-Barre.

UMBELLIFERÆ.

225. **Hydrocotyle Americana,** L. PENNYWORT.
Wyoming swamp. Above Dunmore.

226. **Sanicula Marilandica,** L. BLACK SNAKE-ROOT.
Frequent.

227. **Conium maculatum,** L. POISON HEMLOCK.
More or less frequent in waste places, (*R. N. D. in herb.*)

228. **Cicuta maculata,** L. WATER HEMLOCK.
Wyoming swamp.

229. **Carum Carui,** L. CARAWAY.
Often by roadsides, (*R. N. D. in herb.*)

230. **Sium cicutæfolium,** Gmelin. (*S. lineare,* Michx.)

231. **Pimpinella integerrima,** Benth. and Hook. (*Zizia* of Gray's Man.)
Above Dunmore. Mountain Inn road.

232. **Cryptotænia Canadensis,** DC. HONEWORT.
Not uncommon.

233. **Osmorrhiza brevistylis,** DC. HAIRY SWEET CICELY.
Lynn, (*in herb. R. N. D.*) Mountain Inn road.

234. **Thaspium trifoliatum,** Gray.
Campbell's Ledge. Lower Lackawanna Valley.

235. **Archangelica hirsuta,** Torr. and Gray.
Campbell's Ledge. Near pond in the lower Lackawanna Valley. Near Mocanaqua.

236. **A. atropurpurea,** Hoffm.
Near the pond in the lower Lackawanna Valley.

237. **Peucedanum sativum,** Benth. and Hook. (*Pastinaca sativa,* L.) WILD PARSNIP.
Frequent.

238. **Daucus carota,** L. WILD CARROT.
Frequent in the Lackawanna Valley. Occasional near Wilkes-Barre.

ARALIACEÆ.

239. **Aralia racemosa,** L. SPIKENARD. WHITE-ROOT.
Near Campbell's Ledge. By the Mountain Inn road, and on the red shales of the River Mountains.

240. **A. hispida,** Michx. BRISTLY SARSAPARILLA.
Top of the River Mountains. Common near Archbald, (*R. N. D. in herb.*) Common on the barren ledges near Gouldsboro, etc.

241. **A. nudicaulis,** L. WILD SARSAPARILLA.
Frequent.

CORNACEÆ.

242. **Cornus Canadensis,** L. BUNCH-BERRY.
Swamp at the head of Little Roaring Brook. Abundant near Moosic Mountain back of Scranton, (*Mrs. Buell*). Plainsville, (*R. N. D. in herb.*)

243. **C. florida,** L. FLOWERING DOGWOOD.
Frequent in woods.

244. **C. circinata,** L'Her.
Elk Hills. Bald Mountain.

245. **C. sericea,** L. SILKY DOGWOOD.
Frequent in low thickets.

246. **C. stolonifera,** Michx. RED OSIER.
Frequent.

247. **C. alternifolia,** L.
Frequent.

248. **Nyssa multiflora,** Wang. PEPPERIDGE.
Frequent in rocky woods. Rarely in the valley bottoms.

GAMOPETALÆ.

CAPRIFOLIACEÆ.

249. **Sambucus racemosa,** L. (*S. pubens,* Michx.) RED-BERRIED ELDER.
Frequent.

250. **S. Canadensis,** L. COMMON ELDER.

251. **Viburnum lantanoides,** Michx. HOBBLE-BUSH.
Near Archbald "pot holes." Woods about Lehigh Pond. Near Mountain Inn road. Also in herb. R. N. D.

252. **V. acerifolium,** L. MAPLE-LEAVED ARROW-WOOD.
Frequent in upland woods.

253. **V. pubescens.** Pursh. DOWNY ARROW-WOOD.
Elk Mountain.

254. **V. dentatum,** L.
Frequent in low grounds.

255. **V. cassinoides,** L. (*V. nudum,* L., *var. cassinoides.* Man. p. 206.)
Head of Little Roaring Brook. In swamps about Gouldsboro. Near Moosic Lake.

256. **V. Lentago,** L. SWEET VIBURNUM.
Common.

257. **Linnæa borealis,** Gronov. TWIN-FLOWER.
"Near Dunmore Cemetery, scarce," (*Mrs. Buell*). Professor Porter says it is found in the counties of Sullivan, Lycoming and Tioga (see "Sketch").

258. **Lonicera ciliata,** Muhl. FLY HONEYSUCKLE.
Elk Mountain. Near Lackawanna, at Green Ridge, (*Mrs. Beeber*). "Not rare in the Alleghenies, and found by me on the Pocono," (*Prof. Porter*).

259. **L. Glauca,** Hill. (*L. parviflora,* Lam. Man. p. 204.)
Frequent.

260. **Diervilla trifida,** Mœnch. BUSH HONEYSUCKLE.
Elk Mountain. Bald Mountain. Mountain Inn road. Campbell's Ledge, etc.

RUBIACEÆ.

261. **Houstonia cærulea,** L. BLUETS. INNOCENCE. WILD FORGET-ME-NOT.
Above Dunmore. Campbell's Ledge. Plainsville, (*R. N. D. in herb.*) Near Kingston, (*Miss Bannister*).

262. **Cephalanthus occidentalis,** L. BUTTON-BUSH.
Moosic Mountain. Taylorville marsh. Swamp near Wyoming.

263. **Mitchella repens,** L. PARTRIDGE-BERRY.
Frequent.

264. **Galium Aparine,** L. CLEAVERS.
Near Campbell's Ledge.

265. **G. circæzans,** Michx.
Frequent.

266. **G. lanceolatum,** Torr.
Frequent.

267. **G. trifidum,** L. SMALL BEDSTRAW.
Lehigh Pond.

268. **G. asprellum,** Michx. ROUGHER BEDSTRAW.
Swamp near Wyoming.

269. **G. triflorum,** Michx. SWEET BEDSTRAW.
Campbell's Ledge. Mountain Inn road.

DIPSACEÆ.

270. **Dipsacus sylvestris,** Mill. TEASEL.
North of Taylorville (apparently not common).

COMPOSITÆ.

271. **Vernonia noveboracensis,** Willd. IRONWEED.
Lower Lackawanna Valley near the pond.

272. **Eupatorium purpureum,** L. PURPLE THOROUGHWORT.
Frequent.

273. **E. sessilifolium,** L.
Near Wyoming.

274. **E. perfoliatum,** L. BONESET.
Frequent.

275. **E. ageratoides,** L. WHITE SNAKE-ROOT.
Frequent.

276. **Solidago squarrosa,** Muhl.
Near Campbell's Ledge. West side Lackawanna Valley.

277. **S. cæsia,** L.
Frequent.

278. **S. latifolia,** L.
Mountain Inn road. Solomon's Gap, south of Wilkes-Barre.

279. **S. bicolor,** L.
Frequent.

280. **S. bicolor,** L. **var. concolor,** Gr. and Torr.
Woods at the foot of Campbell's Ledge.

281. **S. odora,** Ait. SWEET-SCENTED GOLDEN-ROD.
Frequent in rocky soil on the mountains.

282. **S. puberula,** Nutt.
Mountains southeast of Wilkes-Barre, (*in herb. W. R. D.*)

283. **S. uliginosa,** Nutt. (*S. stricta* of the Man. p. 240.)
Near Lehigh Pond.

284. **S. rugosa,** Mill. (*S. altissima,* L. of Man. p. 243.)
Frequent in both valleys.

285. **S. ulmifolia,** Muhl.
Woods near Campbell's Ledge.

286. **S. neglecta,** Torr. and Gray.
"Near Pocono Station, D., L. & W. R. R., 1869," (*Prof. Porter.*)

287. **S. arguta,** Ait. (*S. Muhlenbergii,* Torr. and Gray, Man. p. 243.)
Frequent on the mountains.

288. **S. juncea,** Ait. (*S. arguta* of Gray's Man. p. 243.)
Campbell's Ledge, etc.; probably common.

289. **S. serotina,** Ait. (*S. gigantea* of Gray's Man. p. 245.)
Common in Wyoming and lower Lackawanna Valley.

290. **S. Canadensis,** L.
Common.

291. **S. nemoralis,** Ait.
Frequent.

292. **S. lanceolata,** L.
Frequent.

293. **Sericocarpus conyzoides,** Nees. WHITE-TOPPED ASTER.
Wilkes-Barre Mountain. Woods on Campbell's Ledge.

294. **Aster corymbosus,** Ait.
Common.

295. **A. macrophyllus,** L.
Bald Mountain woods.

296. **A. Novæ Angliæ,** L.
Not abundant. Lower Lackawanna Valley. Campbell's Ledge. Wyoming. Kingston. North of Wilkes-Barre.

297. **A. undulatus,** L.
Frequent in mountain woods.

298. **A. cordifolius,** L.
Common.

299. **A. lævis**, L.
Lower Lackawanna Valley and elsewhere. A slender form with open panicle along the railroad above Solomon's Gap.

300. **A. patens**, Ait.
Frequent along mountain roads and on dry banks.

301. **A. ericoides**, L.
Lower Lackawanna and Wyoming Valleys.

302. **A. diffusus**, Ait. (*A. miser* of Manual.)
Frequent.

303. **A. paniculatus**, Lam. (*A. carneus*, Nees, Man. p. 233.)
Near Wyoming, Kingston, and lower Lackawanna Valley.

304. **A. prenanthoides**, Muhl.
Seen only near Waymart, but probably within limits.

305. **A. puniceus**, L.
Low grounds east of Wilkes-Barre. Along Black Creek.

306. **A. umbellatus**, Mill. (*Diplopappus umbellatus* of Man.)
Woods above Dunmore.

307. **A. infirmus**, Michx. (*Diplopappus cornifolius* of Man.)
Ledges along Mountain Inn road, (*in herb. W. R. D.*)
Ledges above Mocanaqua.

308. **A. linarifolius**, L. (*Diplopappus linarifolius* of Man.)
Apparently frequent on mountain declivities. Wilkes-Barre Mountains. Bald Mountain. Campbell's Ledge, etc.

309. **A. acuminatus**, Michx.
Frequent in ravines and mountain woods.

310. **Erigeron bellidifolius**, Muhl. ROBIN'S PLANTAIN.
Abundant near Campbell's Ledge, probably so elsewhere.

311. **E. Philadelphicus**, L. PINK FLEABANE.
Near Mocanaqua by railroad. (?)

312. **E. annuus**, Pers. TALL DAISY.
Frequent.

313. **E. strigosus,** Muhl. DAISY FLEABANE.
Frequent.

314. **E. Canadensis,** L. HORSEWEED.
Abundant.

315. **Antennaria plantaginifolia,** Hook. PLANTAIN-LEAVED EVERLASTING.
Frequent in pastures.

316. **Anaphalis margaritacea,** Benth. and Hook. (*Antennaria margaritacea*, R. Br., Man. p. 269.) PEARLY EVERLASTING.
Frequent.

317. **Gnaphalium polycephalum,** Michx.
Frequent in mountain woods.

318. **G. decurrens,** Ives. COMMON EVERLASTING.
Tobyhanna, 1881, and Moosic Lake, 1884, (*Prof. Porter*).

319. **G. uliginosum,** L.
Frequent.

320. **Inula Helenium,** L. ELECAMPANE.
Below Lackawanna Station on L. & B. R. R.

321. **Polymnia Canadensis,** L. LEAF-CUP.
In rocky woods near the road by Campbell's Ledge. Apparently scarce in Pennsylvania, Professor Porter reporting it only from the southeastern part of the State, at two stations.

322. **Ambrosia trifida,** L. GREAT RAGWEED.
Along the Susquehanna River, (*R. N. D. in herb.*)

323. **A. artemisæfolia,** L. RAGWEED.
Common.

324. **Xanthium Canadense,** Mill. COCKLE-BUR.
Susquehanna River banks.

325. **Heliopsis lævis,** Pers. OX-EYE.
Near the mouth of the Lackawanna River.

326. **Rudbeckia hirta,** L. YELLOW DAISY. CONE FLOWER.
Common, (*R. N. D. in herb.*) Near Wilkes-Barre and Wyoming.

327. **Helianthus divaricatus,** L.
Frequent on the mountains.

328. **H. decapetalus,** L.
Lower Lackawanna Valley.

329. **H. tuberosus,** L. JERUSALEM ARTICHOKE.
Opposite Wilkes-Barre on the river-bank. By the railroad between Pittston and Campbell's Ledge.

330. **H. giganteus,** L.
Near the pond in the lower Lackawanna Valley.

331. **Bidens frondosa,** L. COMMON BEGGAR-TICKS.
Lower Lackawanna Valley.

332. **B. connata,** Muhl.
Bog above Taylorville, etc.

333. **B. cernua,** L.
Near the pond in the lower Lackawanna Valley.

334. **B. chrysanthemoides,** Michx.
Common, (*R. N. D. in herb.*)

335. **Helenium autumnale,** L. SNEEZE-WEED.
Mouth of the Lackawanna River (?)

336. **Anthemis Cotula,** L.
Common.

337. **Achillæa millifolium,** L. YARROW.
Common.

338. **Chrysanthemum Leucanthemum.** L. DAISY.
Lower Lackawanna Valley.

339. **Tanacetum vulgare,** L. TANSY.
Common.

340. **Senecio** (Sp. ?)
Near Kingston, (*Miss Bannister*).

341. **Erechthites hieracifolia**, Raf. FIRE-WEED.
Common, (*R. N. D.*) Especially in clearings on the mountains.

342. **Arctium Lappa**, L. (*Lappa officinalis*, All.) BURDOCK.
Common.

343. **Cnicus** (*Cirsium*, of DC.) **arvensis**, Hoffm. CANADA THISTLE.
Not observed in Wyoming Valley. Occasional above and below Scranton.

344. **C. lanceolatus**, Hoffm. COMMON THISTLE.
Common.

345. **C. pumilus**, Torr. PASTURE THISTLE.
Tobyhanna Mills and Pocono Station, (*Prof. Porter*).

346. **C. altissimus**, Willd. **var. discolor**, Gray. (*Cirsium discolor*, Spring.)
Frequent in the lower Lackawanna Valley.

347. **Hieracium Canadense**, Michx. CANADA HAWKWEED.
Woods, occasional.

348. **H. paniculatum**, L.
Frequent.

349. **H. venosum**, L. RATTLESNAKE HAWKWEED.
Frequent.

350. **H. scabrum**, Michx. ROUGHER HAWKWEED.
In woods; the slender form approaching *H. Marianum* (see Gray's *Synoptical Flora of N. Amer.*) occurs along the Mountain Inn road and elsewhere.

351. **Prenanthes alba**, L. (*Nabalus albus*, Hook.)
Mountain Inn road. Bald Mountain woods.

352. **P. serpentaria**, Pursh. (*N. Fraseri*, DC.)
Mountain woods, frequent.

353. **P. altissima**, L. (*N. altissimus*, Hook.)
Tobyhanna Mills, (*Prof. Porter*).

354. **Taraxacum officinale**, Web. (*T. Dens-leonis*, Desf.) DANDELION.
Common.

355. **Lactuca Canadensis**, L. WILD LETTUCE.
Ledge near Keyser Valley, and elsewhere.

356. **L. leucophæa**, Gray. (*Mulgedium leucophæum*, DC.)
Abundant in the lower Lackawanna Valley.

357. **Sonchus oleraceus**, L.
Ledge near Keyser Valley. Scranton streets.

LOBELIACEÆ.

358. **L. cardinalis**, L. CARDINAL FLOWER.
Roaring Brook, (*Mrs. Buell*). In herb. R. N. D. from Wyoming Valley (?)

359. **L. syphilitica**, L. GREAT BLUE LOBELIA.
Near Kingston, (*Miss Bannister*). On the red shales along the Mountain Inn road.

360. **L. inflata**, L. INDIAN TOBACCO.
Fields, etc.; common.

361. **L. spicata**, Lam.
Common, (*R. N. D. in herb.*)

CAMPANULACEÆ.

362. **Specularia perfoliata**, A. DC.
"Common in fields," (*R. N. D. in herb.*)

363. **Campanula rotundifolia**, L. HAREBELL.
Campbell's Ledge and elsewhere. In herb. R. N. D.

364. **C. aparinoides,** Pursh. MARSH BELL-FLOWER.
Marsh above Gouldsboro.

ERICACEÆ.

365. **Gaylussacia resinosa,** Torr. and Gray. BLACK HUCKLEBERRY.
Mountain and other dry woods.

366. **G. frondosa,** Torr. and Gray. DANGLEBERRY.
Pocono Station on D., L. & W. R. R., and Moosic Lake, (*Prof. Porter*).

367. **Vaccinium stamineum,** L. DEER-BERRY.
Mountain woods, frequent.

368. **V. Pennsylvanicum,** L. DWARF BLUEBERRY.
Open, rocky soil or in mountain woods. A variable species, a form—possibly a good *variety*—with glaucous serrulate leaves and large, blackish berries, occurs with the type on Bald Mountain summit.

369. **V. Canadense,** Kalm. CANADA BLUEBERRY.
Lehigh Pond, (*in herb. W. R. D.*) Near its southern limit.

370. **V. vacillans,** Soland. LOW BLUEBERRY.
Common in dry woods.

371. **V. corymbosum,** L. SWAMP BLUEBERRY.
In the round marsh above Taylorville. Lower Lackawanna Valley, near the pond. In mountain swamps.

372. **V. Oxycoccus,** L. SMALL CRANBERRY.
Near Tobyhanna, 1881, (*Prof. Porter*). Near its southern limit.

373. **V. macrocarpon,** Ait. CRANBERRY.
About Lehigh Pond, (*in herb. W. R. D.*) Centre County is its southern limit, (*Prof. Porter*).

374. **Chiogenes hispidula,** Torr. and Gray. CREEPING SNOWBERRY.
Near Tobyhanna Mills, 1881, (*Prof. Porter*). Near its southern limit.

375. **Epigæa repens**, L. TRAILING ARBUTUS. MAYFLOWER.
Nay-Aug, etc., (*Mrs. Beeber*). Near Scranton, (*Mrs. Buell*). Common, (*R. N. D.*) River Mountains, etc.

376. **Gaultiera procumbens**, L. WINTERGREEN. TEABERRY.
Common.

377. **Andromeda polifolia**, L.
About Lehigh Pond, (*in herb. W. R. D.*) Not south of northeastern Pennsylvania, (*Prof. Porter*).

378. **A. ligustrina**, Muhl.
Moosic Mountain. Bald Mountain woods. South of Wilkes-Barre.

379. **Cassandra calyculata**, Don. LEATHERLEAF.
The round marsh north of Taylorville, and near the head of Little Roaring Brook, (*in herb. W. R. D.*) About Lehigh Pond. Marsh above Gouldsboro.

380. **Kalmia latifolia**, L. MOUNTAIN LAUREL.
Frequent.

381. **K. angustifolia**, L. SHEEP LAUREL.
Frequent. One of the most abundant and striking plants of the Lackawanna Valley.

382. **K. glauca**, Ait. PALE LAUREL.
Marsh about Lehigh Pond, (*in herb. W. R. D.*) Near its southern limit.

383. **Rhododendron nudiflorum**, Torr. (*Azalea nudiflorum*, L. Man. p. 299.) PINK AZALEA.
Common.

384. **R. viscosum**, Torr. WHITE AZALEA.
Pocono Station, (*Prof. Porter*).

385. (?) **R. calendulaceum**, Torr.
Forms on Bald Mountain summit, in fruit, apparently belong here, but they may be forms of *R. nudiflorum*.

386. **R. maximum,** L. BIG LAUREL. LAUREL.
Along the Lackawanna River below Taylorville. Along ravines descending from the mountains, and abundant in the evergreen forest tracts on the mountains.

387. **R. Rhodora,** Don. (*Rhodora Canadensis,* L., Gray's Man. p. 300.)
Slope of Moosic Mountains above Dunmore, (*in herb. W. R. D.*) Abundant on the Pocono, (*Prof. Porter*). Near its southern limit.

388. **Ledum latifolium,** Ait. LABRADOR TEA.
About Lehigh Pond. In the marsh above Gouldsboro by the railroad. Near its southern limit. Before reported from Pennsylvania only from the Tunkhanna, by Prof. Porter.

389. **Chimaphila umbellata,** Nutt. PRINCE'S PINE.
From the Lackawanna Valley, (*R. N. D. in herb.*) Near Scranton, (*Mrs. Buell*).

[**Moneses uniflora,** Gray, was found in northern Pennsylvania by the elder Canby, the specimen being at present in Prof. Porter's herbarium, but the locality remains unknown.]

390. **Pyrola rotundifolia,** L. FALSE WINTERGREEN.
Mountain Inn road and elsewhere.

391. **P. elliptica,** Nutt.
Common, (*R. N. D. in herb.*)

392. **Monotropa uniflora,** L. INDIAN PIPE.
Lynn, (*R. N. D. in herb.*) Near Scranton, (*Mrs. Buell*).

PRIMULACEÆ.

393. **Trientalis Americana,** Pursh. STAR-FLOWER.
Head of Little Roaring Brook. Lackawanna Valley, (*Mrs. Buell*). Near Green Ridge, (*Mrs. Beeber*).

394. **Steironema ciliatum,** Raf. (*Lysimachia ciliata,* L.)
Near the mouth of the Lackawanna River.

395. **Lysimachia quadrifolia,** L.
Common in thickets and mountain woods.

396. **L. stricta,** Ait.
"Very common on margins of standing water," (*R. N. D.*)

397. **L. thyrsiflora,** L.
Swamp near Wyoming. Northeastern Pennsylvania and north, (*Prof. Porter*).

OLEACEÆ.

398. **Fraxinus Americana,** L. WHITE ASH.
Frequent in the lower Lackawanna Valley. Keyser Valley, etc. "Occasional," (*R. N. D.*)

399. **F. sambucifolia,** Lam. BLACK ASH.
By the river below Scranton. "Occasional," (*R. N. D.*)

APOCYNACEÆ.

400. **Apocynum androsæmifolium,** L. DOGBANE.
Common, (*R. N. D. in herb.*)

401. **A. cannabinum,** L. INDIAN HEMP.
Lower Lackawanna Valley. Shores of the Susquehanna.

ASCLEPIADACEÆ.

402. **Asclepias incarnata,** L. SWAMP MILKWEED.
"Common," (*R. N. D. in herb.*) Peckville, etc.

403. **A. Cornuti,** Decaisne. COMMON MILKWEED.
Common.

404. **A. quadrifolia,** Michx.
Below Campbell's Ledge, (*R. N. D. in herb.*)

GENTIANACEÆ.

405. **Gentiana crinita,** Frœl. FRINGED GENTIAN.
Red shales of the Mountain Inn road, (*in herb. W. R. D.*) In Scott, on the mountains five miles from Scranton, (*Mrs. Buell and Mrs. Beeber*).

406. **G. quinqueflora,** Lam.
"Rare in fields back of Plainsville," (*R. N. D. in herb.*)

407. **G. Saponaria,** L.
Red shales of the Mountain Inn road, (*in herb. W. R. D.*)

408. **G. Andrewsii,** Griseb.
Scott Township, about five miles from Scranton, (*Mrs. Buell*). Near Kingston, (*Miss Bannister*).

409. **G. linearis,** Frœl. (*G. Saponaria,* L. *var. linearis,* Gray.)
Pocono Station and Tobyhanna, 1881, (*Prof. Porter*).

410. **Bartonia tenella,** Muhl.
Moosic Lake, (*Prof. Porter*).

411. **Menyanthes trifoliata,** L. BUCKBEAN.
About Lehigh Pond, (*in herb. W. R. D.*)

POLEMONIACEÆ.

412. **Phlox subulata,** L. MOSS-PINK.
Mountain sides, (*R. N. D. in herb.*) Near Kingston, (*Miss Bannister*). Campbell's Ledge.

HYDROPHYLLACEÆ.

413. **Hydrophyllum Virginicum,** L. WATER-LEAF.
Elk Mountain, north knob.

BORRAGINACEÆ.

414. **Cynoglossum officinale,** L. HOUNDSTONGUE.
Near Scranton, (*Mrs. Buell*). South of Scranton.

415. **Echinospermum Virginicum,** Lehm. (*Cynoglossum Morisoni,* DC.)
Lower Lackawanna Valley.

416. **E. Lappula,** Lehm. STICKSEED.
Ledges near Keyser Valley.

417. **Myosotis laxa,** Lehm. (*M. palustris,* With., *var. laxa,* Gray.) The FORGET-ME-NOT (of America).
Near Scranton, (*Mrs. Buell*).

CONVOLVULACEÆ.

418. **Convolvulus sepium,** L. (*Calystegia sepium,* R. Br.)
Lower Lackawanna Valley.

419. **Cuscuta Gronovii,** Willd. DODDER.
Near Laflin, on D. & H. R. R., (*R. N. D. in herb.*)

SOLANACEÆ.

420. **Solanum Dulcamara,** L. NIGHTSHADE BITTER-SWEET.
Common, (*R. N. D.*)

421. **Lycium vulgare,** Dunal. MATRIMONY-VINE.
Near Kingston, (*Miss Bannister*).

422. **Datura stramonium,** L. STRAMONIUM.
Port Griffith and common, (*in herb. R. N. D.*) North of Wilkes-Barre.

SCROPHULARIACEÆ.

423. **Verbascum Thapsus,** L. MULLEIN.
Common.

424. **Linaria vulgaris,** Mill. TOAD-FLAX.
Common.

425. **Scrophularia nodosa,** L. FIGWORT.
Frequent in the lower Lackawanna Valley, and Keyser Valley. Above Carbondale.

426. **Chelone glabra,** L. TURTLE-HEAD.
"Scarce," (*R. N. D. in herb.*) Frequent in lower Lackawanna Valley. Near Kingston, (*Miss Bannister*).

427. **Pentstemon pubescens,** Soland. BEARD-TONGUE.
Foot of Campbell's Ledge, (*R. N. D. in herb.*)

428. **Mimulus ringens,** L. MONKEY-FLOWER.
Lower Lackawanna Valley.

429. **Ilysanthes gratioloides,** Benth. FALSE PIMPERNEL.
Tobyhanna Mills, 1881, (*Prof. Porter*).

430. **Veronica Americana,** Schwein. BROOK-LIME.
Near the pond in the lower Lackawanna Valley.

431. **V. officinalis,** L. COMMON SPEEDWELL.
Frequent near Wilkes-Barre. Near Keyser Valley.

432. **V. serpyllifolia,** L. THYME-LEAVED SPEEDWELL.
Common.

433. **Gerardia pedicularia,** L.
Bank west of the lower Lackawanna Valley.

434. **G. flava,** L. DOWNY FALSE FOXGLOVE.
Woods of Campbell's Ledge. In herb. R. N. D.

435. **G. quercifolia,** Pursh. SMOOTH FALSE FOXGLOVE.
On Campbell's Ledge.

436. **G. tenuifolia,** Vahl. SLENDER GERARDIA.
Campbell's Ledge. Red shales of the River Mountains.

437. **Pedicularis Canadensis,** L. LOUSEWORT.
Near Scranton, (*Mrs. Bucll*). In herb. W. R. D.

438. **Melampyrum Americanum,** Michx. COW-WHEAT.
Campbell's Ledge. Mountain Inn Road. On the River Mountains.

OROBANCHACEÆ.

439. **Epiphegus Virginiana,** Bart. BEECH-DROPS.
In herb. R. N. D.

LENTIBULACEÆ.

440. **Utricularia vulgaris**, L. COMMON BLADDERWORT.
Pond in the lower Lackawanna Valley.

ACANTHACEÆ.

441. **Dianthera Americana**, L. WATER-WILLOW.
Shores of the Susquehanna near Mocanaqua. Elsewhere in Pennsylvania only on the lower Susquehanna and Juniata, (*Prof. Porter*).

VERBENACEÆ.

442. **Verbena urticæfolia**, L. WHITE VERVAIN.
Common.

443. **V. hastata**, L. BLUE VERVAIN.
Common.

LABIATÆ.

444. **Trichostema dichotomum**, L. BLUE-CURLS.
Top of Campbell's Ledge, (*in herb. W. R. D.*)

445. **Teucrium Canadense**, L. GERMANDER.
In herb. R. N. D., probably from near the Susquehanna.

446. **Collinsonia Canadensis**, L. HORSE BALM.
Lower Lackawanna Valley, etc.

447. **Mentha viridis**, L. SPEARMINT.
Common, (*R. N. D. in herb.*)

448. **M. piperita**, L. PEPPERMINT.
Common.

449. **M. Canadensis**, L. WILD MINT.
Along the Susquehanna.

450. **Lycopus Virginicus**, L. BUGLE-WEED.
In herb R. N. D.

451. **L. sinuatus,** Ell. (*L. Europæus*, L., *var. sinuatus*, Man. p. 345.)
Lower Lackawanna Valley.

452. **Cunila Mariana,** L. DITTANY.
Top of Campbell's Ledge, (*in herb. W. R. D.*) Red shales of the River Mountains.
Dr. Gray, in the *Synoptical Flora of North America*, says it occurs "from southern New York and Ohio to Georgia. This station is not far from its northern limit, although I have collected it near New York City.

453. **Pycnanthemum incanum,** Michx. MOUNTAIN MINT.
Frequent on banks near the lower Lackawanna Valley.

454. **Calamintha Clinopodium,** L. BASIL.
Common.

455. **Melissa officinalis,** L. COMMON BALM.
Near Scranton, (*Mrs. Buell*).

456. **Hedeoma pulegeoides,** Pers. PENNYROYAL.
Common.

457. **Monarda didyma,** L. SCARLET BALM.
Frequent in the lower Lackawanna Valley.

458. **M. fistulosa,** L. WILD BERGAMOT.
Bank west of the pond in the lower Lackawanna Valley.

459. **Lophanthus scrophulariæfolius,** Benth. GIANT HYSSOP.
Near old track of the D., L. & W. in the lower Lackawanna Valley.

460. **Nepeta cataria,** L. CATNIP.
Common.

461. **Scutellaria lateriflora,** L. SKULL-CAP.
Tobyhanna, 1881, (*Prof. Porter*).

462. **Brunella vulgaris,** L. BRUNELLA.
Common.

463. **Physostegia Virginiana,** Benth. FALSE DRAGON-HEAD.
Gravelly shores of the Susquehanna southeast of Mocanaqua, (*in herb. W. R. D.*) On its northeastern limit. Prof. Porter reports it from Pennsylvania only from the Schuylkill below Norristown, and from southeastern Pennsylvania (its eastern limit), and from Presque Isle on Lake Erie.

464. **Leonurus cardiaca,** L. MOTHERWORT.
Lower Lackawanna Valley.

465. **Stachys aspera,** Michx. (*S. palustris,* L., *var. aspera,* Gray.)
Near Kingston, (*Miss Bannister*).

PLANTAGINACEÆ.

466. **Plantago major,** L. PLANTAIN.
Near Wilkes-Barre.

467. **P. Rugelii,** Decaisne. (*P. Kamtschatica,* of Man. p. 311, in part.)
Lower Lackawanna Valley. "Common," (*R. N. D. in herb.*) The distinction between these two species is clearly set forth in the *Botanical Gazette,* iii., p. 41, 1878. See also *Cayuga Flora,* p. 74.

468. **P. lanceolata,** L. RIBWORT PLANTAIN.
Common.

APETALÆ.

ILLICEBRACEÆ.

469. **Anychia dichotoma,** Michx.
River Mountains (?)

470. **Scleranthus annuus,** L.
Frequent in barren fields near Wilkes-Barre.

AMARANTACEÆ.

471. **Amarantus retroflexus,** L. RED-ROOT PIGWEED.
Abundant below Scranton.

472. **A. albus,** L.
Common. A prostrate *Amarantus* with large seeds, short bracts, and resembling *A. blitoides*, Watson, (see *Proc. of Amer. Acad.*, xii., p. 273, and *Cayuga Flora*, p. 75) but having the utricle of *A. albus*, was found on the L. & B. R. R. near the station north of Kingston, (*in herb. W. R. D.*)

CHENOPODIACEÆ.

473. **Chenopodium album,** L. PIGWEED.
Common.

474. **C. hybridum,** L. MAPLE-LEAVED GOOSEFOOT.
Ledges above Taylorville.

475. **C. Botrys,** L. JERUSALEM OAK.
Wilkes-Barre.

476. **C. ambrosioides,** L. MEXICAN TEA.
Abundant in streets of Wilkes-Barre.

477. **Atriplex patula,** L. **var. hastata,** Gray.
Streets of Wilkes-Barre (?)

PHYTOLACCACEÆ.

478. **Phytolacca decandra,** L. POKEBERRY.
Frequent.

POLYGONACEÆ.

479. **Rumex obtusifolius,** L. BITTER DOCK.
Common, (*R. N. D. in herb.*)

480. **R. crispus,** L. YELLOW DOCK.
Common.

481. **R. acetosella,** L. SHEEP-SORREL.
Common.

482. **Polygonum Careyi,** Olney.
Pocono Station, D., L. & W. R. R., (*Prof. Porter*). Near the pond in the lower Lackawanna Valley, a doubtful specimen.

483. **P. Pennsylvanicum,** L.
Near Kingston, etc.

484. **P. incarnatum,** Ell.
Probably within limits, (*R. N. D. in herb.*)

485. **P. Persicaria,** L.
Near Scranton, (*Mrs. Buell*).

486. **H. Hydropiper,** L. SMARTWEED.
Common.

487. **P. acre,** H. B. K.
Frequent in swamps.

488. **P. hydropiperoides,** Michx. WATER-PEPPER.
Shore of Susquehanna below Mocanaqua (*in herb. W. R. D.*)

489. **P. amphibium,** L.
Shore of Susquehanna southeast of Mocanaqua.

490. **P. tenue,** Michx.
Top of Campbell's Ledge, (*in herb. W. R. D.*)

491. **P. aviculare**, L. KNOT-GRASS.
Common, (*R. N. D. in herb.*)

492. **P. erectum**, L. (*P. aviculare*, L., *var. erectum*, Man. p. 417.)
Common, (*R. N. D. in herb.*)

493. **P. arifolium**, L. TEAR-THUMB.
Lower Lackawanna Valley.

494. **P. sagittatum**, L.
Tobyhanna, 1881, (*Prof. Porter*).

495. **P. convolvulus**, L. BLACK BINDWEED.
Frequent.

496. **P. dumetorum**, L., **var. scandens**, Gray. CLIMBING BUCKWHEAT.
Lower Lackawanna Valley. Near Mocanaqua (*in herb. W. R. D.*), and elsewhere in low grounds.

497. **P. cilinode**, Michx.
Near Dunnings and near Tobyhanna, on D., L. & W. R. R. Northeastern Pennsylvania, (*Prof. Porter*).

498. **Fagopyrum esculentum**, Mœnch. BUCKWHEAT.
Escaped. (*R. N. D. in herb.*)

ARISTOLOCHIACEÆ.

499. **Asarum Canadense**, L. WILD GINGER.
In herb. R. N. D., probably within limits.

LAURACEÆ.

500. **Sassafras officinale**, Nees. SASSAFRAS.
"Common," (*R. N. D. in herb.*) Woods in lower Lackawanna Valley and on Bald Mountain. Scarce east of Dunmore.

501. **Lindera Benzoin**, Meisner. SPICE-BUSH.
By road south of Lackawanna Station; probably frequent.

THYMELACEÆ.

502. **Dirca palustris**, L. LEATHERWOOD. MOOSEWOOD.
Elk Mountain.

LORANTHACEÆ.

503. **Arcenthobium pusillum**, Pk. THE LESSER MISTLETOE.
Parasite on the limbs of the black spruce, in the swamp at the head of Little Roaring Brook; also on the dwarf forms about Lehigh Pond; discovered June 30 and July 6, 1886. (*In herb. W. R. D.*) Hitherto not known outside of New York.

EUPHORBIACEÆ.

504. **Euphorbia maculata**, L. CREEPING SPURGE.
Wilkes-Barre, etc.

505. **E. hypericifolia**, L.
Fields near Wyoming.

506. **Acalypha Virginica**, L.
Ledges near Keyser Valley.

CERATOPHYLLACEÆ.

507. **Ceratophyllum demersum**, L. HORNWORT.
Pond in lower Lackawanna Valley.

CALLITRICHACEÆ.

508. **Callitriche heterophylla**, Pursh. WATER STARWORT.
Tobyhanna Mills, (*Prof. Porter*).

URTICACEÆ.

509. **Ulmus fulva**, Michx. SLIPPERY ELM.
Lower Lackawanna Valley.

510. **U. Americana,** L. WHITE ELM.
Common.

511. **Celtis occidentalis,** L. HACKBERRY.
South of Everhart's Island, and south of Lackawanna Station near Lackawanna River.

512. **Morus rubra,** L. RED MULBERRY.
Near road south of Lackawanna Station.

513. **Urtica gracilis,** Ait. SLENDER NETTLE.
Common, (*R. N. D. in herb.*)

514. **Laportea Canadensis,** Gaud. WOOD NETTLE.
Common, (*R. N. D. in herb.*)

515. **Pilea pumila,** Gray. RICHWEED.
Common, (*R. N. D. in herb.*)

516. **Parietaria Pennsylvanica,** Muhl. PELLITORY.
Ledges above Taylorville.

517. **Humulus Lupulus,** L. HOP.
"Escaped," (*in herb. R. N. D.*)

PLATANACEÆ.

518. **Platanus occidentalis,** L. BUTTONWOOD. SYCAMORE.
Along the Lackawanna and Susquehanna Rivers.

JUGLANDACEÆ.

519. **Juglans cinerea,** L. BUTTERNUT.
Lower Lackawanna Valley. Along the Susquehanna.

520. **J. nigra,** L. BLACK WALNUT.
"Occasional," (*R. N. D.*) Scarce in Lackawanna Valley from Scranton to Pittston. Along the Susquehanna. (Also above the Wyoming Valley to Ulster.)

521. **Carya alba,** Nutt. SHAGBARK HICKORY.
Woods, frequent.

522. **C. microcarpa,** Nutt.
Lower Lackawanna Valley (?)

523. **C. tomentosa,** Nutt. MOCKERNUT.
Campbell's Ledge woods, rather frequent. Southeast of Wilkes-Barre, (*in herb. W. R. D.*) (*In herb. R. N. D.* without label.)

524. **C. porcina,** Nutt. PIGNUT HICKORY.
Campbell's Ledge woods, etc.

525. **C. amara,** Nutt. BITTERNUT HICKORY.
Near the Lackawanna River above Pittston, also near its mouth.

MYRICACEÆ.

526. **Myrica Comptonia,** C. DC. (*Comptonia asplenifolia,* Ait.) SWEET FERN.
Common in all dry woods.

527. **M. Gale,** L. SWEET GALE.
Pond south of Waymart. (Not seen within limits.)

BETULACEÆ.

528. **Betula lenta,** L. BLACK BIRCH. SWEET BIRCH.
Frequent.

529. **B. lutea,** Michx. YELLOW BIRCH.
Swamp at head of Little Roaring Brook. Near Gouldsboro.

530. **B. alba, var. populifolia,** Spach. WHITE BIRCH.
Dry soil, frequent.

531. **B. papyrifera,** Marshall. PAPER OR CANOE BIRCH.
By the mountain road near the summit of Bald Mountain, (*in herb. W. R. D.*)

532. **B. nigra,** L. RIVER BIRCH.
From Peckville to Wilkes-Barre and below. Abundant near Providence, and on Everhart's Island above Pittston.

533. **Alnus incana,** Willd. SPECKLED ALDER.
Lower Lackawanna Valley. On Moosic Mountains.

534. **A. serrulata,** Willd. SMOOTH ALDER.
Lower Lackawanna Valley. Moosic Mountain slopes. Lower slopes of Bald Mountain. Mountain Inn road. (*In herb. W. R. D.*)

CUPULIFERÆ.

535. **Corylus Americana,** Walt. HAZEL-NUT.
Lackawanna Valley and Keyser Valley.

536. **C. rostrata,** Ait. BEAKED HAZEL.
Common, (*R. N. D.*) Ledges above Taylorville.

537. **Ostrya Virginica,** Willd. IRON-WOOD. DEER-WOOD.
Frequent.

538. **Carpinus Caroliniana,** Walt. BLUE BEECH.
Along all the streams, (*R. N. D. in herb.*)

539. **Quercus alba,** L. WHITE OAK.
Common.

540. **Q. bicolor,** Willd. SWAMP WHITE-OAK.
Toward the head of Little Roaring Brook.

541. **Q. Prinus,** L. ROCK OAK. CHESTNUT OAK.
Frequent on the Moosic and Bald Mountains, etc.

542. **Q. illicifolia,** Wang. SCRUB OAK.
Abundant on the mountains. Also on the sandstone ledge above Taylorville, (*in herb. W. R. D.*)

543. **Q. coccinea,** Wang. SCARLET OAK.
Frequent along Lackawanna River. Bald Mountain and Moosic Mountain slopes.

544. **Q. tinctoria,** Bartram. YELLOW OAK.
Frequent.

545. **Q. rubra,** L. RED OAK.
Common.

546. **Castanea vulgaris,** Lam. **var. Americana,** A. DC. (*C. vesca,* L., *var. Americana,* Michx., Man. p. 455.) CHESTNUT.
Abundant in dry or mountain woods.

547. **Fagus ferruginea,** Ait. BEECH.
Along the Lackawanna River below Scranton, and occasional elsewhere.

SALICACEÆ.

548. **Salix nigra,** Marshall. BLACK WILLOW.
Abundant along the Lackawanna and Susquehanna Rivers. Low grounds on Moosic Mountains, (*in herb. W. R. D.*)

549. **S. discolor,** Muhl. PUSSY WILLOW.
Mountains east of Wilkes-Barre, etc.

550. **S. rostrata,** Richards. (*S. livida, var. occidentalis,* Man. p. 464.)
Tobyhanna Mills and Pocono Station, (*Prof. Porter*). Mountain Inn road.

551. **S. sericea,** Marshall. SILKY WILLOW.
Lackawanna Valley above and below Scranton.

552. **S. humilis,** Marshall. LOW WILLOW.
Near Tobyhanna.

553. **S. cordata,** Muhl. HEART-LEAVED WILLOW.
Lower Lackawanna Valley.

554. **Populus tremuloides,** Michx. QUAKING ASPEN.
Common.

555. **P. grandidentata,** Michx.
Lower Lackawanna Valley. Keyser Valley.

556. **P. dilatata,** Ait. LOMBARDY POPLAR.
Escaped near Archbald, (*R. N. D. in herb.*)

MONOCOTYLEDONS.

ORCHIDACEÆ.

557. **Corallorhiza multiflora,** Nutt. CORAL-ROOT.
Woods on Bald Mountain slope. Lynn, (*herb. R. N. D.*)

558. **Spiranthes cernua,** Richard. LADIES' TRESSES.
Moosic Lake, 1884, (*Prof. Porter*).

559. **S. gracilis,** Bigel.
Woods near Scranton, (*Mrs. Beeber*).

560. **Goodyera pubescens,** R. Br. RATTLESNAKE PLANTAIN.
Woods near Scranton, (*Mrs. Beeber*).

561. **Calopogon pulchellus,** R. Br. CALOPOGON.
Road to Moosic Lake and road to Little Roaring Brook swamp on Moosic Mountain.

562. **Pogonia ophioglossoides,** Nutt. POGONIA.
Shores of Moosic Lake.

563.* **Habenaria tridentata,** Hook.
Moosic Lake, 1884, (*Prof. Porter*).

565. **H. Hookeri,** Torr.
Woods near Lehigh Pond.

566. **H. ciliaris,** R. Br. YELLOW FRINGED ORCHIS.
Moosic Lake, 1884, (*Prof. Porter*).

567. **H. blephariglottis,** Hook. WHITE FRINGED ORCHIS.
Pocono Station, (*Prof. Porter*).

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*562 (?) **H. hyperborea,** R. Br., is recorded from northeastern Pennsylvania by Prof. Porter, and ought to occur near Lehigh Pond. In my notes of July 6, 1886, is recorded "*H. dilatata*, near Lehigh Pond." As Prof. Porter writes that the latter has never been found in the State, it may have been a clerical error for *H. hyperborea*.

568. **H. psycodes,** Gray.
Lackawanna Valley, (*herb. R. N. D.*) Near Crystal Lake.

569. **H. fimbriata,** R. Br. PURPLE FRINGED ORCHIS.
Near Lehigh Pond.

570. **Cypripedium parviflorum,** Salisb. SMALL YELLOW LADY-SLIPPER.
Near Kingston, (*Miss Bannister*).

571. **C. acaule,** Ait. PINK LADY-SLIPPER.
Woods west of Lehigh Pond, (*in herb. W. R. D.*) Near Plainsville, (*in herb. R. N. D.*) Near Scranton, (*Mrs. Buell*). Near Kingston, (*Miss Bannister*).

IRIDACEÆ.

572. **Iris versicolor,** L. BLUE FLAG.
Common.

573. **I. Virginica,** L.
Near Kingston, (*Miss Bannister*).

574. **Sisyrinchium anceps,** Cav. (*S. Bermudiana,* in part.) BLUE-EYED GRASS.
Common, (*R. N. D. in herb.*)

AMARYLLIDACEÆ.

575. **Hypoxys erecta,** L. STAR-GRASS.
Not very common, (*R. N. D. in herb.*) Toward the head of Little Roaring Brook, by the road.

HÆMODORACEÆ.

576. **Aletris farinosa,** L.
On the "Camel's Back," near Pittston, (*Prof. Porter*).

DIOSCORACEÆ.

577. **Dioscorea villosa,** L. WILD YAM.
Black Creek, near the mine of the West End Breaker. Lower Lackawanna Valley, (*in herb. W. R. D.*)

SMILACEÆ.

578. **Smilax rotundifolia,** L. GREEN BRIER.
East of Dunmore, and near the sandstone ledge above Taylorville, (*in herb. W. R. D.*) Frequent in the lower Lackawanna Valley.

579. **S. rotundifolia,** L., **var. quadrangularis,** Gr., is not infrequent on the slopes of the Moosic Mountains. From the inadequate description of this *variety*, it is liable to be mistaken for *S. tamnoides.* Its leaves are oblong usually, spinulose toothed on the margin, and often slightly fiddle-shaped.

580. **S. hispida,** Muhl.
Lower Lackawanna Valley.

581. **S. herbacea,** L. CARRION-FLOWER.
East of Dunmore. Near Mountain Inn road.

LILIACEÆ.

582. **Polygonatum biflorum,** Ell. SOLOMON'S SEAL.
Campbell's Ledge. Mountain Inn road.

583. **Smilacina racemosa,** Desf. FALSE SOLOMON'S SEAL.
Near Kingston, (*Miss Bannister*). East of Dunmore.

584. **S. stellata,** Desf.
Bog between Gouldsboro and Tobyhanna.

585. **S. trifolia,** Desf. THREE-LEAVED SOLOMON'S SEAL.
Swamp at head of Little Roaring Brook. Lehigh Pond.

586. **Maianthemum Canadense,** Desf. (*Smilacina bifolia, var. Canadensis*, Gr., Man. p. 530.)
"Everywhere in the shade," (*R. N. D. in herb.*) Near Kingston, (*Miss Bannister*).

587. **Asparagus officinale,** L. ASPARAGUS.
Near river at Mocanaqua.

588. **Lilium Philadelphicum,** L. WOOD LILY.
Woods toward Moosic Lake. Mountain Inn road. Near Kingston, (*Miss Bannister*).

589. **Erythronium Americanum**, Smith. ADDER-TONGUE.
Plainsville, (*R. N. D. in herb.*)

590. **Uvularia perfoliata**, L. BELLWORT.
Common, (*R. N. D.*)

591. **U. grandiflora**, Smith, is in herb. R. N. D., probably from this region.

592. **Oakesia sessilifolia**, Wats. (*Uvularia sessilifolia*, Man. p. 528.)
Common, (*R. N. D. in herb.*)

593. **Clintonia borealis**, Raf. CLINTONIA.
"Near Archbald pot hole and probably elsewhere," (*R. N. D. in herb.*) Near Lehigh Pond and in swamp northeast of Tobyhanna.

594. **Medeola Virginica**, L. INDIAN CUCUMBER-ROOT.
Near Lehigh Pond. In herb. R. N. D.

595. **Trillium erectum**, L. BIRTHROOT.
Common, (*R. N. D. in herb.*) Near Lehigh Pond.

596. **T. grandiflorum**, Salisb. WHITE TRILLIUM.
Elk Mountain (?)

597. **T. erythrocarpum**, Michx. PAINTED TRILLIUM.
Scott Township, and abundant near Jones's Lake, Wayne County, (*Mrs. Buell*). Winton, (*Mrs. Beeber*). Near Little Roaring Brook Swamp. Near Lehigh Pond.

598. **Amianthium muscætoxicum**, Gray. FLY-POISON.
Abundant in woods on Moosic Mountain, west and south of Moosic Lake.

PONTEDERIACEÆ.

599. **Pontederia cordata**, L. PICKEREL-WEED.
Swamp near Wyoming.

ERIOCAULONACEÆ.

600. **Eriocaulon septangulare**, With.
Pond south of Waymart. (Probably within limits.)

XYRIDACEÆ.

601. **Xyris flexuosa**, Muhl., **var. pusilla**, Gr.
Moosic Lake and Tobyhanna Mills, (*Prof. Porter*).

JUNCACEÆ.

602. **Luzula campestris**, DC. WOOD-RUSH.
Woods near Campbell's Ledge.

603. **Juncus effusus**, L. BULRUSH.
Lower Lackawanna Valley, etc.

604. **J. marginatus**, Rostkov.
Mountain Inn road, on red shales.

605. **J. bufonius**, L.
Tobyhanna, Pocono Station, Moosic Lake, (*Prof. Porter*).

606. **J. pelocarpus**, E. Meyer.
Tobyhanna Mills, (*Prof. Porter*).

607. **J. tenuis**, Willd.
Bald Mountain woods, etc.

608. **J. Canadensis**, J. Gay, **var. subcaudatus**, Eng.
Shore of the Susquehanna near Mocanaqua (*herb. W. R. D.*)

609. **J. Canadensis**, J. Gay, **var. coarctatus**, Eng.
Near Gouldsboro, and near the Mountain Inn road, (*in herb. W. R. D.*)

TYPHACEÆ.

610. **Typha latifolia**, L. CAT-TAIL.
Near pond in lower Lackawanna Valley, etc.

611. **Sparganium simplex**, Hudson. BUR-REED.
Near Plainsville, (*in herb. R. N. D.*)

612. **S. simplex**, Huds., **var. fluitans**, Gr.
Tobyhanna Mills, (*Prof. Porter*).

ARACEÆ.

613. **Arisæma triphyllum**, Torr. INDIAN TURNIP.
Plainsville, (*R. N. D. in herb.*) Frequent.

614. **Calla palustris**, L. WILD CALLA.
Tobyhanna, 1881, (*Prof. Porter*). Lehigh Pond and the marsh above Gouldsboro, (*in herb. W. R. D.*)

615. **Orontium aquaticum**, L. GOLDEN CLUB.
Swamp one mile east of Plainsville, (*in herb. R. N. D.*) Moosic Lake, (*in herb. W. R. D.*)

616. **Symplocarpus fœtidus**, Salisb. SKUNK CABBAGE.
Common, (*R. N. D.*)

617. **Acorus calamus**, L. SWEET FLAG.
Frequent.

LEMNACEÆ.

618. **Lemna minor**, L. DUCKWEED.
Swamp near Wyoming.

619. **Spirodela polyrrhiza**, Schleid. (*Lemna polyrrhiza*, L.)
Swamp near Wyoming.

ALISMACEÆ.

620. **Alisma Plantago**, L., **var. Americanum**, Gr. WATER PLANTAIN.
Near Wyoming.

621. **Sagittaria variabilis**, Englm. ARROW-HEAD.
Mouth of the Lackawanna River. Near Kingston.

NAIADACEÆ.

622. **Scheuchzeria palustris**, L.
Tobyhanna Mills, (*Prof. Porter*).

623. **Potamogeton natans,** L.
Pond in the lower Lackawanna Valley.

624. **P. Claytonii,** Tuck.
Tobyhanna Mills, (*Prof. Porter*).

CYPERACEÆ.

625. **Cyperus diandrus,** Torr.
Tobyhanna Mills, (*Prof. Porter*).

626. **Dulichium spathaceum,** Richard.
Tobyhanna Mills, 1881, (*Prof. Porter.*)

627. **Eleocharis obtusa,** Schultes.
Near Wilkes-Barre, etc.

628. **E. palustris,** R. Br.
Swamp near Wyoming.

629. **Scirpus subterminalis,** Torr.
Moosic Lake, 1884, (*Prof. Porter*).

630. **S. pungens,** Vahl.
Moosic Lake, 1884, (*Prof. Porter*).

631. **S. debilis,** Pursh.
Shores of the Susquehanna opposite Wilkes-Barre.

632. **S. Eriophorum,** Michx. WOOL-GRASS.
Near pond in lower Lackawanna Valley, etc. The slender mountain form of this species is in herbarium from Moosic Lake and near Lehigh Pond.

633. **Eriophorum vaginatum,** L.
About Lehigh Pond, (*in herb. W. R. D.*) Besides this, only two other stations in the State are known, according to Prof. Porter.

634. **E. Virginicum,** L.
Lehigh Pond, (*in herb. W. R. D.*)

635. **E. polystachyon,** L.
Tobyhanna Mills, (*Prof. Porter*).

636. **Fimbristylis capillaris,** Gray.
In sand near the railroad siding at Campbell's Ledge, (*in herb. W. R. D.*)

637. **Rhynchospora alba,** Vahl.
About Lehigh Pond, (*in herb. W. R. D.*)

638. **R. glomerata,** Vahl.
Mountain Inn road, (*in herb. W. R. D.*)

639. **Cladium mariscoides,** Torr.
About Lehigh Pond.

640. **Carex teretiuscula,** Good.
Lehigh Pond, (*in herb. W. R. D.*)

641. **C. vulpinoidea,** Michx.
Lackawanna Valley.

642. **C. stipata,** Muhl.
Near Gouldsboro, etc.

643. **C. rosea,** Schk., **var. radiata,** Dew.
Woods near Archbald "pot hole," (*in herb. W. R. D.*)

644. **C. trisperma,** Dew.
Marsh at the head of Little Roaring Brook. A form with setaceous leaves, near Lehigh Pond and the marsh above Gouldsboro, (*in herb. W R. D.*)

645. **C. canescens,** L.
Near Lehigh Pond, (*in herb. W. R. D.*)

646. **C. canescens,** L., **var. vitilis,** Carey.
Woods near Lehigh Pond, (*in herb. W. R. D.*)

647. **C. Deweyana,** Schk.
Luzerne County (its southern limit for Pennsylvania), (*Prof. Porter*).

648. **C. sterilis,** Willd.
Near Moosic Lake. Marsh above Gouldsboro, (*in herb. W. R. D.*)

649. **C. echinata,** Murr., **var. microstachys,** Bœck. (*C. stellulata, var. scirpoides,* Carey, Man. p. 579.)
Marsh above Gouldsboro.

650. **C. scoparia,** Schk.
Near Moosic Lake, etc., (*in herb. W. R. D.*)

651. **C. adusta,** Boott.
By railroad south of Gouldsboro (spikes inclining to be compound and plants robust. They correspond to Boott's fig. 381). Near the upper "pot hole" near Archbald, and on the River Mountains, (the *C. argyrantha* form). (*In herb. W. R. D.*)

652. **C. torta,** Boott.
In herb. R. N. D., from within limits probably.

653. **C. angustata,** Boott., **var. strictior,** Boott.
Head of Little Roaring Brook. Marsh above Gouldsboro. Near Lehigh Pond, (*in herb. W. R. D.*)

654. **C. gynandra,** Schw.
Head of Little Roaring Brook. Pocono Station and Tobyhanna, (*Prof. Porter*).

655. **C. limosa,** L.
Lehigh Pond, (*in herb. W. R. D.*)

656. **C. Magellanica,** Lam. (*C. irrigua,* Sm., Man. p. 584.)
Swamp above Gouldsboro, where the specimens have much more obtuse perigynia than the ordinary American forms. Bracts are longer than the culm, and the plant robust. Also at Lehigh Pond. (*In herb. W. R. D.*)

657. **C. granularis,** Muhl.
Near Crystal Lake.

658. **C. virescens,** Muhl.
Near Archbald, (*in herb. W. R. D.*) Ledges above Taylorville.

659. **C. retrocurva,** Dew.
Beech woods west of Dundaff.

660. **C. digitalis**, Willd.
Beech woods west of Dundaff.

661. **C. Hitchcockiana**, Dew.
Beech woods west of Dundaff, (*in herb. W. R. D.*) Rare in Pennsylvania, (*Prof. Porter*).

662. **C. Pennsylvanica**, Lam.
Woods near Wilkes-Barre, etc.

663. **C. varia**, Muhl.
Bald Mountain, (*in herb. W. R. D.*) Ledges above Taylorville.

664. **C. debilis**, Michx.
Head of Little Roaring Brook. Near Archbald. Moosic Mountains. The perigynia of the latter specimens are larger than usual, and in texture and nerves suggest *C. glabra*, but the orifice is hyaline and there is a slight beak, (*in herb. W. R. D.*)

665. **C. trichocarpa**, Muhl.
Lower Lackawanna Valley.

666. **C. tentaculata**, Muhl.
Above Gouldsboro, etc.

667. **C. tentaculata**, Muhl., **var. gracilis**, Boott.
Swamp near Tobyhanna, (*in herb. W. R. D.*)

668. **C. intumescens**, Rudge.
Tobyhanna Mills, 1881, (*Prof. Porter*).

669. **C. lupulina**, Muhl.
By the railroad above Gouldsboro.

670. **C. folliculata**, L., (*in herb. W. R. D.*)
Head of Little Roaring Brook. Moosic Lake.

671. **C. utriculata**, Boott.
Moosic Lake, 1884, and Tobyhanna, (*Prof. Porter.*)

The following additional species of rare *Carices* have been reported by Prof. Porter from northern or northeastern Pennsylvania, but outside our limits: *C. pauciflora*, Lightfoot,

from Wayne County; *C. chordorhiza*, Ehr., and *C. arcta*, Boott., from Tioga County; *C. pallescens*, L., *C. arctata*, Boott., *C. æstivalis*, M. A. C., *C. subulata*, Michx., from northeastern Pennsylvania; *C. longirostris*, Torr., and *C. oligosperma*, Michx., from Monroe County. These may be confidently sought for in our territory, as well as a considerable number of commoner forms which have been overlooked because of incomplete exploration or hasty observation.

GRAMINEÆ.

672. **Panicum glabrum**, Gaudin.
Near Wilkes-Barre.

673. **P. sanguinale**, L. CRAB-GRASS.
Common.

674. **P. proliferum**, Lam.
Southeast of Wilkes-Barre, on the flat near the Empire Shaft, in the influence of the brackish overflow from the mine, (*in herb. W. R. D.*)

675. **P. agrostoides**, Spreng.
Shores of the Susquehanna southeast of Mocanaqua.

676. **P. capillare**, L. OLD-WITCH GRASS.
Near Wyoming, etc.

677. **P. virgatum**, L.
The river-terrace near the railroad siding at Campbell's Ledge.

678. **P. latifolium**, Muhl.
Lower Lackawanna Valley.

679. **P. clandestinum**, L.
Lower Lackawanna Valley.

680. **P. xanthophysum**, Gray.
Elk Mountain between the knobs, (*in herb. W. R. D.*) Luzerne County, (*Prof. Porter*)—its southern limit.

681. **P. dichotomum**, L.
Lower Lackawanna Valley. Wyoming Valley, etc.

682. **P. dichotomum**, L., **var. nitidum**, Gray.
Bald Mountain, (*in herb. W. R. D.*)

683. **P. dichotomum**, L., **var. pubescens**, Vasey.
Moosic Lake. Near Providence, (*in herb. W. R. D.*)

684. **P. depauperatum**, Muhl.
Frequent.

685. **P. Crus-galli**, L. BARN-YARD GRASS.
Near Kingston, etc.

[A form,—possibly *P. nervosum*, Muhl.,—was collected on Moosic Mountain and Campbell's Ledge, but more material is needed to decide with certainty.]

686. **Setaria glauca**, Beauv. FOX-TAIL.
Frequent.

687. **S. viridis**, Beauv.
Frequent.

688. **Leersia oryzoides**, Swartz. CUT-GRASS.
Near the mouth of the Lackawanna.

689. **Andropogon scoparius**, Michx.
Frequent in dry soils. A glaucous form occurs on Campbell's Ledge and the River Mountains.

690. **Anthoxanthum odoratum**, L. SWEET-SCENTED GRASS.
Tobyhanna, 1881, (*Prof. Porter.*)

691. **Aristida dichotoma**, Michx.
Near the breaker, southeast of Wilkes-Barre, (*in herb. W. R. D.*)

692. **Oryzopsis asperifolia**, Michx. MOUNTAIN RICE.
Moosic Mountain.

693. **Milium effusum**, L.
Luzerne and Lackawanna Counties, (*Prof. Porter*).

694. **Muhlenbergia sobolifera,** Trin.
Ledges above Taylorville, (*in herb. W. R. D.*)

695. **M. glomerata,** Trin.
Bald Mountain. Southeast of Wilkes-Barre, (*in herb. W. R. D.*)

696. **M. Mexicana,** Trin.
Frequent.

697. **M. sylvatica,** Torr. and Gray.
Ledges above Taylorville.

698. **Brachyelytrum aristatum,** Beauv.
Moosic Lake, (*Prof. Porter*).

699. **Phleum pratense,** L. TIMOTHY.
Frequent.

700. **Agrostis perennans,** Tuck.
Ledges above Taylorville.

701. **A. scabra,** Willd.
Tobyhanna and Pocono Station, (*Prof. Porter*).

702. **A. vulgaris,** With. RED TOP.
Common.

703. **A. vulgaris,** With., **var. alba,** Vasey. (*A. alba,* L.)
Tobyhanna, (*Prof. Porter*).

704. **Cinna arundinacea,** L.
Lower Lackawanna Valley.

705. **C pendula,** Trin.
"Tobyhanna and Moosic Lake, not uncommon in Pennsylvania," (*Prof. Porter*).

706. **Deyeuxia** (*Calamagrostis* of Gray's Man., p. 614,) **Canadensis,** Beauv.
Pocono Station, (*Prof. Porter*); probably frequent.

707. **D Nuttalliana,** Stend.
Moosic Lake and Tobyhanna, (*Prof. Porter*).

708. **D. Porteri,** Vasey. A doubtful specimen of this rare plant, with leaves only, was found near Moosic Lake.

709. **Deschampsia** (*Aira* of Man. p. 641) **flexuosa,** Vasey.
Near Taylorville. Near pond in lower Lackawanna Valley. Bald Mountain summit.

710. **Danthonia compressa,** C. F. Austin.
Moosic Lake, (*Prof. Porter*).

711. **D. spicata,** Beauv.
Bald Mountain, (*in herb. W. R. D.*)

712. **Eleusine Indica,** Gært.
In Shickshinny village, (*in herb. W. R. D.*)

713. **Eatonia Dudleyi,** Vasey. (See *Cayuga Flora*, p. 126.)
Woods near Archbald "pot hole."

714. **Kœleria cristata,** Pers.
Top of Campbell's Ledge and River Mountains, (*in herb. W. R. D.*) Prof. Porter says of this: "It is credited to Pennsylvania in Gray's Manual, but these are the first specimens I have seen from our State."

715. **Poa compressa,** L.
Bald Mountain. Campbell's Ledge, (*in herb. W. R. D.*)

716. **P. pratensis,** L. KENTUCKY BLUE-GRASS.
Frequent.

717. **Glyceria Canadensis,** Trin. RATTLESNAKE GRASS.
Near the pond in the lower Lackawanna Valley.

718. **G. elongata,** Trin.
Swamp at head of Little Roaring Brook, (*in herb. W. R. D.*)

719. **Eragrostis reptans,** Nees.
Along the Susquehanna.

720. **Elymus striatus,** Willd.
Top of Campbell's Ledge.

GYMNOSPERMÆ.

CONIFERÆ.

721. **Taxus Canadensis,** Willd. (*T. baccata,* L., *var. Canadensis,* Man. p. 474.) GROUND HEMLOCK.

"In deep woods," (*R. N. D.*) Swamp near the Mountain Inn road.

722. **Pinus strobus,** L. WHITE PINE.

Common on the hills.

723. **P. resinosa,** Ait. NORWAY PINE. RED PINE.

Probably within limits, as would be indicated by a remark of Michaux in his *Sylva* (iii., p. 91): "I have not seen it (*Pinus resinosa*) beyond Wilkes-Barre, Pa." Prof. Porter reports it from Tioga County.

724. **P. inops,** Ait. SCRUB PINE.

South of Warrior Run and south of Wanamie. It is not infrequent along the Mountain Inn road.

725. **P. rigida,** Mill. PITCH PINE.

Frequent on dry hills.

726. **Picea nigra,** Link. (*Abies nigra,* Poir.) BLACK SPRUCE.

Swamp at the head of Little Roaring Brook. About Lehigh Pond, near Tobyhanna, and elsewhere on the Pocono plateau.

727. **Tsuga Canadensis,** Carriere. (*Abies Canadensis,* Michx.) HEMLOCK.

Archbald. Campbell's Ledge. Near Little Roaring Brook. Mountain Inn road, etc.

728. **Abies balsamea,** Miller. FIR. BALSAM FIR.

Lehigh Pond and woods near. Near Tobyhanna in swamp.

729. **Larix Americana,** Michx. LARCH. TAMARACK.

About Lehigh Pond.

Juniperus Virginiana, L., RED CEDAR, is not recorded in my notes, but is probably frequent along such declivities as Campbell's Ledge.

THE VASCULAR CRYPTOGAMIA.

EQUISETACEÆ.

730. **Equisetum arvense**, L.
Common, (*R. N. D. in herb.*)

731. **E. hyemale**, L. SCOURING RUSH.
Occasional.

732. **E. limosum**, L.
Near Pocono Station, (*Prof. Porter*).

FILICES.

733. **Polypodium vulgare**, L. POLYPODY.
Common.

734. **Pellæa atropurpurea**, Link. CLIFF-BRAKE.
Sandstone Ledge above Taylorville, and Campbell's Ledge, (*in herb. W. R. D.*) Elk Mountain.

735. **Pteris aquilina**, L. BRAKE.
Common, (*in herb. R. N. D.*)

736. **Adiantum pedatum**, L. MAIDEN-HAIR FERN.
Common, (*in herb. R. N. D.*)

737. **Camptosonis rhizophyllus**, Link. WALKING-LEAF.
Ledge above Taylorville. Campbell's Ledge. By railroad above Mocanaqua, on the conglomerate, where the fronds are strongly auricled at the base. In herb. W. R. D. In herb. R. N. D. from Lynn.

738. **Asplenium Trichomanes**, L.
Frequent on rocks.

739. **Asplenium ebeneum**, Ait.
Frequent. Woods above Dunmore, and above Taylorville. Elk Mountain. Mountain Inn road.

740. **A. montanum**, Willd. MOUNTAIN SPLEENWORT.
On the southern face of the cliffs on Bald Mountain summit. This has been found in Pennsylvania only on the Susquehanna below Harrisburg, on the Delaware at Easton, and at Glen Onoko on the Lehigh, (*Prof. Porter*). It is not known farther north than the Shawangunk Mountains in New York.

741. **A. thelypteroides**, Michx.
In herb. R. N. D., who thinks it came from the valleys.

742. **A. Filix-fœmina**, Bernh. LADY FERN.
Frequent in ravines, etc.

743. **Phegopteris polypodioides**, Fee. BEECH FERN.
Abundant above Carbondale. White Oak Glen near Archbald, (*R. N. D. in herb.*)

744. **P. hexagonoptera**, Fee.
Elk Mountain.

745. **P. Dryopteris**, Fee.
Archbald near the "pot hole"; also White Oak Glen, (*R. N. D. in herb.*)

746. **Aspidium Novaboracense**, Swz.
Moosic and Bald Mountain woods. Mountain Inn road, etc.

747. **A. spinulosum**, Swz. (type form).
Swamps near the head of Little Roaring Brook.

748. **A. spinulosum**, Swz., **var. intermedium**, Eaton.
Frequent.

749. **A. spinulosum**, Swz., **var. dilatum**, Gray.
Near Tobyhanna, (*Prof. Porter*).

750. **A. cristatum**, Swz.
Tobyhanna, (*Prof. Porter*).

751. **A. marginale**, Swz.
Frequent.

752. **A. acrostichoides**, Swz. CHRISTMAS FERN.
Mountain woods and ravines.

753. **Onoclea sensibilis**, L. SENSITIVE FERN.
Common in low grounds. The form *obtusilobata* is in Mr. Davis's herbarium as "very rare."

754. **Cystopteris fragilis**, Bernh.
Elk Mountain. Sandstone above Taylorville.

755. **Woodsia Ilvensis**, R. Br.
Elk Mountain, on Prospect Rock. Campbell's Ledge, (*in herb. W. R. D.*)

756. **W. obtusa**, Torrey.
Elk Mountain. Campbell's Ledge.

757. **Dicksonia pilosiuscula**, Willd.
Common on newly cleared slopes, etc.

758. **Osmunda regalis**, L. ROYAL FLOWERING FERN.
Toward head of Little Roaring Brook. Near Plainsville church, (*R. N. D. in herb.*)

759. **O. Claytoniana**, L.
Toward the source of Little Roaring Brook, etc.

760. **O. cinnamomea**, L.
Moosic Mountain. Taylorville marsh, etc.

761. **Botrychium ternatum**, Swz., **var. obliquum**, Eaton.
Near Waymart.

762. **B. Virginicum**, Swz. GRAPE FERN.
Frequent in woods.

LYCOPODIACEÆ.

763. **Lycopodium lucidulum**, Michx.
Frequent in damp woods.

764. **L. inundatum**, L.
Moosic Lake, (*Prof. Porter*).

765. **L. dendroideum**, Michx.
Near Archbald "pot hole." Mountain Inn road, (*in herb. W. R. D.*)

766. **L. clavatum**, L. CLUB-MOSS.
Near Archbald, (*R. N. D. in herb.*) Near Waymart.

767. **L. complanatum**, L.
Moosic Lake and Tobyhanna, (*Prof. Porter*).

[L. selago, a subalpine or alpine species, has been found by Prof. Porter on the Blue Mountains at the Delaware Water Gap.

768. **Selaginella rupestris**, Spring.
Bald Mountain. Campbell's Ledge. Rocks on Little Wilkes-Barre Mountain. Elk Mountain.

769. **Isoetes Engelmanni**, Braun., **var. gracilis**, Engel. QUILLWORT.
Shores of the Susquehanna near Mocanaqua, (*in herb. W. R. D.*)

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PROCEEDINGS

AND

LIST OF BOOKS AND SPECIMENS

DONATED TO THE

LIBRARY AND MUSEUM

DURING THE YEAR

1886.

PROCEEDINGS.

PRELIMINARY MEETING.

The following call appeared in the *Scranton Republican* of Thursday, November 26, 1885 :—

TO THE PUBLIC:

The importance of the fossil flora of the coal measures to scientific research, the value of studious collections, and the necessity of the preservation of specimens are plainly apparent to the general public. No organized effort exists to centralize and locate collections and specimens in this vicinity, and it is eminently proper that a locality so rich and fruitful in deposit should organize a representative institution.

In order that this very worthy purpose may be accomplished, it is proposed to form a Natural Science and Historical Association; and a meeting of interested citizens is hereby called to consider the question at the Scranton Board of Trade rooms on Friday evening, November 27th. The public are invited.

Respectfully,

J. A. PRICE,	DAVID SPENCER,
A. W. DICKSON,	E. A. HEERMANS,
A. L. BAKER,	G. W. PHILLIPS,
JAMES H. TORREY,	WM. T. SMITH,
S. B. PRICE,	S. C LOGAN,
EDWARD JONES,	C. E. CHITTENDEN,
H. M. BOIES,	I. F. EVERHART,
D. N. GREEN,	M. R. WALTER,
EDWARD B. STURGES,	F. L. BROWN,
FRED. W. GUNSTER,	GEORGE A. JESSUP,
J. F. SNYDER,	E. S. JACKSON,
N. S. DAVIS,	ROBT. D. SCHIMPFF,
THOMAS D. DAVIES,	G. L. DICKSON,
JOHN T. WILLIAMS,	J. C. PLATT,
R. G. BROOKS,	S. H. MOORE,

C. L. R. WHEELER.

In response to this call the following persons met at the time and place named :

THOS. R. BEEBER,	SAM'L. C. LOGAN,
HENRY BELIN, JR.,	R. W. LUCE,
NATHANIEL S. DAVIS,	SIDNEY H. MOORE,
G. EDGAR DEAN,	J. EMMET O'BRIEN,
ALEX. W. DICKSON,	J. A. PRICE,
IRVING A. FINCH,	ROBT. D. SCHIMPFF,
L. M. GATES,	WILLIAM T. SMITH,
DOUGLAS N. GREEN,	C. L. R. WHEELER,
PETER F. GUNSTER,	WILLIAM A. WILCOX.
ALFRED HAND,	

The meeting was called to order by Col. PRICE. Rev. Dr. LOGAN was elected Chairman and Mr. WHEELER Secretary.

Messrs. WHEELER, PRICE, DICKSON, HAND, SMITH, GREEN and O'BRIEN were appointed a committee to report a plan of organization and to enroll members.

Messrs. HAND, STURGES and WILCOX were appointed to report a form of charter.

Adjourned to meet December 11, at the same place.

ADJOURNED MEETING, DECEMBER 11, 1885.

Rev. Dr. LOGAN in the chair.

The Committee on Organization was directed to prepare By-laws and have them printed for consideration by the Society at the next meeting.

The Committee on Charter submitted a draft which was approved, and the committee was directed to apply for incorporation accordingly. "THE LACKAWANNA INSTITUTE OF HISTORY AND SCIENCE" was adopted as the name to be used, and WILLIAM CONNELL, J. A. PRICE, ALEX. W. DICKSON, B. H. THROOP and ALFRED HAND were elected for Trustees.

It was voted that the present officers be continued as a temporary organization until such time as a permanent organization is effected.

Mr. WILCOX was elected temporary Treasurer.

Adjourned to meet at the same place January 22, 1886.

ADJOURNED MEETING, JANUARY 22, 1886.

Rev. Dr. LOGAN in the chair. Messrs. STURGES, WILCOX and TORREY were added to the Committee on Organization.

Adjourned to meet at the same place February 2, 1886.

ADJOURNED MEETING, FEBRUARY 2, 1886.

Rev. Dr. LOGAN in the chair.

The Committe on Organization, Enrollment and By-laws submitted by-laws as to membership, dues, officers, meetings and quorums, and recommended that other subjects remain to be supplied from time to time as required. The by-laws submitted were amended and adopted.

A permanent organization under the charter and by-laws was then had by the election of a President and Board of Trustees, as follows:

President, J. A. PRICE.

Trustees:

WM. CONNELL, J. A. PRICE,
ALEX. W. DICKSON, BENJ. H. THROOP,
ALFRED HAND.

The Trustees were authorized to negotiate relative to securing rooms.

Rev. Dr. LOGAN, Dr. GUNSTER and Mr. TORREY were appointed a committee to prepare additional by-laws.

STATED MEETING, MARCH 2, 1886.

No quorum present. Adjourned to March 4, 1886.

ADJOURNED MEETING, MARCH 4, 1886.

President PRICE in the chair. The Committee on Charter reported that incorporation had been granted by Judge ARCHBALD under the form of charter approved by the society.

The President, in behalf of the Board of Trustees, reported a conference with the Board of County Commissioners relative to rooms in the county court-house, and that suitable rooms could be had there for an indefinite time, free of rent, the Institute to pay for finishing the rooms, the amount expended therefor to be refunded by the county to the Institute, whenever the Institute is required to give up the rooms.

The Trustees were authorized to have the rooms finished.

The committee appointed February 2 reported a constitution and by-laws, which were amended and adopted. The thanks of the Institute were voted to the committee.

The President was authorized to appoint a committee of five, with WM. T. SMITH as chairman, to nominate the officers required to complete the organization of the Society under the charter, constitution and by-laws.

Messrs. LANSING and WALTER and Dr. GATES were appointed.

The thanks of the Institute were voted to R. M. JOHNSON, for Vol. I of Montfaucon's "Antiquity Explained," David Humphrey's English translation, edition of 1731. This was the beginning of the library.

Mr. SCHIMPFF was requested to read a paper at the meeting in April.

Adjourned to meet at the Board of Trade rooms at eight o'clock P. M. March 11, 1886.

ADJOURNED MEETING, MARCH 11, 1886.

The President in the chair.

Several amendments to the constitution and by-laws were made. The constitution and by-laws were then adopted as a whole.

Dr. GATES, of the Committee on Nominations, presented the committee's report as follows :—

First Vice-President - -	SAMUEL C. LOGAN.
Second Vice-President, - -	H. M. BOIES.
Treasurer, - - - -	J. C. PLATT.
Recording Secretary, - -	ROBERT D. SCHIMPFF.
Corresponding Secretary, -	WILLIAM A. WILCOX.

There were no other nominations

The persons named were elected.

The Board of Directors were instructed to meet on Saturday afternoon, March 20, at 4 o'clock, for the organization of the Board, and to prepare for the work of the Institute.

The Committee on By-laws, appointed February 2, was authorized to make a perfect copy for filing in the archives.

Notice was given by MARION STUART CANN and C. L. R. WHEELER of proposed amendments to the constitution and by-laws.

Adjourned to meet at 7 P. M., April 13, 1886, at the Board of Trade rooms.

MEETING OF TRUSTEES, APRIL 1, 1886.

Present Messrs. PRICE, HAND, LOGAN and SCHIMPFF.

J. C. PLATT communicated his declination of the office of Treasurer.

The President was instructed to confer with Mr. WHEELER in regard to the Curatorship.

ADJOURNED MEETING, APRIL 13, 1886.

The President in the chair.

Notice was given by Mr. OSTHAUS of proposed amendments to the constitution and by-laws.

STATED MEETING, APRIL 13, 1886.

Held in the court-house at 8 o'clock P. M. Above six hundred members and friends of the Institute present.

The President, Mr. PRICE, in the chair. The President delivered an address.

SPENCER F. BAIRD, J. P. LESLIE and CHARLES A. ASHBURNER, in consideration of special interest shown by them in the Institute, were elected honorary members thereof.

The report of the Treasurer *pro tem.* was read and ordered filed.

The Secretary called attention to the proposed amendments of the by-laws.

The Corresponding Secretary presented a report on the library, which was read, ordered filed, and a vote of thanks extended to the several donors.

A list of the donors will be found on a later page.

ROBERT D. SCHIMPFF read a paper on "Solar Physics." He was assisted by P. F. GUNSTER with a stereopticon and views specially prepared by Mr. SCHIMPFF for the illustration of his paper.

The paper was referred to the "Committee on Printing and Permanent Filing of Books and Papers."

A resolution of thanks to Mr. SCHIMPFF for the paper was adopted.

MEETING OF TRUSTEES, MAY 1, 1886.

Present—Messrs. PRICE, THROOP, WILCOX and SCHIMPFF. WM. T. SMITH was appointed Treasurer of the Institute in place of J. C. PLATT, who had declined.

A letter was read from A. S. BICKMORE, of the American Museum of Natural Science, making inquiries regarding the Lackawanna valley, and stating that he proposed coming to Scranton for special scientific investigation.

The President and Dr. THROOP were appointed to make reply to the letter, and give Prof. BICKMORE every possible assistance.

STATED MEETING, MAY 11, 1886.

President PRICE in the chair. The President announced that the Trustees had appointed WM. T. SMITH as Treasurer. The appointment was concurred in.

The Secretary called attention to the proposed amendments of the constitution and by-laws.

The death of THOMAS PHILLIPS, a member of the society, was announced.

ROBERT D. SCHIMPFF and T. J. JENNINGS were appointed a committee to arrange for a summer school of geology and entomology, to be taught by J. C. BRANNER, Professor of Geology in the Indiana University.

The Treasurer *pro tem.* presented his report to date.

STATED MEETING, JUNE 8, 1886.

G. EDGAR DEAN was chosen President *pro tem.*

The by-laws were amended pursuant to notice given.

The number of Trustees having been increased thereby, the following were elected to complete the Board:

H. M. BOIES,	SAMUEL C. LOGAN,
P. F. GUNSTER,	DOUGLAS N. GREEN,
GEO. W. PHILLIPS,	L. M. GATES,

ROBERT D. SCHIMPFF.

The thanks of the Institute were voted to F. E. WOOD, President of Wood's Business College, of Scranton, for engrossing.

MEETING OF TRUSTEES, JUNE 28, 1886.

Present—Messrs. PRICE, THROOP, LOGAN, GATES, GUNSTER, GREEN, PHILLIPS, SCHIMPFF and DICKSON.

It was decided that five Trustees be a quorum for transaction of the business of the Board.

The President for the Committee on Rooms reported that the work was progressing, and Dr. GATES and Mr. GREEN were appointed to superintend its completion.

Dr. GATES and Mr. GREEN were made a committee to have a table and two cases built for the rooms, and were authorized to expend four hundred and fifty dollars for the purpose.

C. L. R. WHEELER was elected Curator for six months, the beginning of the term to be fixed hereafter.

A bill for blank-books, amounting to twenty-six dollars, was presented and ordered paid.

EDWARD JONES, BENJAMIN H. THROOP and J. B. VAN BERGEN were appointed a committee to inquire whether title to the land where the glacial pot holes at Archbald are situated can be had by the Society.

STATED MEETING, JULY, 13, 1886.

No quorum.

STATED MEETING, AUGUST 10, 1886.

Eleven members present.

GEORGE W. PHILLIPS called to the chair.

J. W. GARNEY was elected to membership.

The appointment by the Trustees of Mr. WHEELER as Curator for a term of six months was concurred in.

MEETING OF TRUSTEES, SEPTEMBER 11, 1886.

Held at Dr. THROOP'S office.

Present—Messrs. PHILLIPS, GUNSTER, BOIES, GREEN, THROOP, LOGAN, GATES, DICKSON, SCHIMPFF and PRICE.

Vice-President BOIES in the chair.

A statement from the Treasurer was read.

Dr. GATES, chairman of the committee appointed to superintend the completion of the rooms, reported the same ready for occupancy.

Bills amounting to $886.34 were presented and ordered paid.

On recommendation of L. M. GATES, DOUGLAS N. GREEN and ROBERT D. SCHIMPFF, committee, the term of the Curator was fixed to begin October 1, 1886.

The amount of the bond to be given by the Treasurer under the by-laws was fixed at three thousand dollars, and his compensation was fixed at fifty dollars a year.

STATED MEETING, SEPTEMBER 14, 1886.

Eleven members present.

HERMAN OSTHAUS called to the chair.

The Treasurer's monthly statement was read and filed.

J. C. PLATT was confirmed as second member of the Committee on Historical and Biographical Record.

A. L. BAKER was confirmed as second member of the Committee on Library and Scientific Record.

J. C. PLATT was invited to read a paper on the early history of Scranton at the November meeting.

The Recording Secretary was directed to have printed one thousand copies of the charter and by-laws.

The Corresponding Secretary reported the receipt from the Scranton Board of Trade of one hundred and fifty copies of a pamphlet on Powdered Anthracite and Gas Fuel, to be distributed to the Society's correspondents.

MEETING OF TRUSTEES, OCTOBER 9, 1886.

Present—Messrs. PRICE, GUNSTER, SCHIMPFF, GREEN and DICKSON.

It was decided to have the rooms of the Society open from 9 o'clock to 12 o'clock in the forenoon and from 2 o'clock to 6 o'clock in the afternoon each week-day.

Mr. PRICE was added to the Committee on the glacial pot holes at Archbald appointed June 28, 1886.

STATED MEETING, OCTOBER 12, 1886.

A large number of members present.

Vice-President LOGAN in the chair.

Miss RUIE SHEDD and Miss A. B. RANKIN were elected to membership.

The Treasurer's report was read and filed.

The following resolution was adopted :—

"That Mr. A. L. BAKER be a special committee to report

to the Society whether a full and scientific description of the glacial pot holes at Archbald has been published, and to report such a description or such recommendations as he may see fit."

A vote of thanks to CHARLES GRAHAM was passed for a copy of the Vicksburg *Gazette* of July 4th, 1863, printed on wall paper by Union troops after capture of the city.

DOUGLAS N. GREEN was confirmed as third member of the Committee on Library and Scientific Record.

President PRICE delivered a lecture on the Geology of Great Britain.

Donations to the library were acknowledged. The list appears on a later page.

MEETING OF TRUSTEES, NOVEMBER 9, 1886.

Present—Messrs. PRICE, PHILLIPS, THROOP, GUNSTER, DICKSON, GREEN, GATES and SCHIMPFF.

Bills, amounting to one hundred and fourteen dollars and forty cents, were presented and paid.

STATED MEETING, NOVEMBER 9, 1886.

Held in the court-room. A large audience present.

Vice-President LOGAN in the chair.

Mrs. ABRAM B. MCKINSTRY and Miss CARRIE CONKLING were elected to membership.

J. C. PLATT read a paper on the early history of Scranton, and received a vote of thanks therefor. The paper was referred to the Committee on printing.

A correspondence with DAVID CRAFT, of Wyalusing, was read, regarding a historical paper to be read by him before the Institute.

MEETING OF TRUSTEES, NOVEMBER 17, 1886.

Present—Messrs. PRICE, PHILLIPS, GUNSTER and SCHIMPFF.

The resignation of WM. T. SMITH as Treasurer was read and accepted.

Mr. SCHIMPFF was appointed to audit the account of the Treasurer as presented by his deputy, THEODORE R. STRAUB.

MEETING OF TRUSTEES, NOVEMBER 23, 1886.

Present—Messrs. PRICE, PHILLIPS, DICKSON, GUNSTER and SCHIMPFF.

F. L. PHILLIPS was elected Treasurer in place of WM. T. SMITH, resigned.

Mr. SCHIMPFF reported that he had audited the accounts of the Treasurer and found them correct. A summary is as follows:

RECEIPTS.

From the Treasurer *pro tem*	$295 00	
From members for dues	685 00	
Total receipts		$980 00

DISBURSEMENTS.

Paid orders	$816 06	
Cash on hand	163 94	
		$980 00

Bills, amounting to eighty-three dollars and thirty-three cents, were ordered paid.

MEETING OF TRUSTEES, DECEMBER 10, 1886.

Present—Messrs. PRICE, LOGAN, GUNSTER, GATES, PHILLIPS and SCHIMPFF.

Bills, amounting to ninety-two dollars and thirty-three cents, were presented and orders voted.

Messrs. SCHIMPFF, BAKER and GREEN were appointed a committee to investigate and make recommendations regarding the condition and work of the Institute.

STATED MEETING, DECEMBER 14, 1886.

President PRICE in the chair.

The appointment of Mr. PHILLIPS as Treasurer was concurred in.

STATED MEETING, JANUARY 11, 1887.

President PRICE in the chair.

Seven members present.

A communication from G. P. FRIANT, taxidermist, offering to make a collection of local birds, etc., for the Society was read. The offer was accepted with acknowledgments.

MARION STUART CANN offered to reprint, in phamphlet form, for the Institute a series of historical papers, to be contributed by Dr. THROOP to *The Saturday Argus*,—the Institute to pay the cost of press-work and paper. The offer was accepted.

A resolution was passed inviting HERMAN OSTHAUS to read before the Institute a paper on the "History of Music."

Donations to the library were acknowledged.

Mr. WILCOX was added to the Special Committee on Condition and Work of the Institute appointed December 10.

MEETING OF TRUSTEES, JANUARY 29, 1887.

Present—Messrs. PRICE, GATES, PHILLIPS and SCHIMPFF.

Mr. SCHIMPFF, Chairman of the Committee on Condition and Work of the Institute, presented the committee's report, which was read and approved, and directed to be presented to the Society for action thereon.

ANNUAL MEETING, FEBRUARY 8, 1887.

Held at the Society's rooms.

President PRICE in the chair. Eleven members present.

Messrs. J. F. GREEN, S. N. GALLAND and F. E. NETTLETON were elected to membership.

NATHANIEL S. DAVIS was authorized to take charge of the botanical work and specimens of the Society.

The report of the Special Committee on Condition and Work of the Institute was read and adopted.

The Treasurer's report for the year was read, showing receipts, $1,265.00; disbursements, $1,037.07; balance on hand, $227.93.

The Curator's report was read and filed. A check-list of the coal-flora fossils of the valley, presented therewith, was referred to the Committee on Publication.

Officers for the ensuing year were elected as follows:

President, - - - - -	J. A. PRICE.
First Vice-President, - -	ALEX. W. DICKSON.
Second Vice-President, - -	J. C. PLATT.
Corresponding Secretary, -	WILLIAM A. WILCOX.
Recording Secretary, - -	ROBERT D. SCHIMPFF.
Treasurer, - - - -	F. L. PHILLIPS.

Trustees:

J. A. PRICE,	ALEX. W. DICKSON,
ROBT. D. SCHIMPFF,	G. W. PHILLIPS,
DOUGLAS N. GREEN,	L. M. GATES,
HERMAN OSTHAUS,	H. M. HANNAH,
J. C. PLATT,	J. H. FISHER,
WM. A. WILCOX,	J. EMMET O'BRIEN.

DONATIONS TO THE LIBRARY FOR THE YEAR ARE AS FOLLOWS:	Books.	Pamphlets.	Maps & Manuscripts	Total.
R. M. Johnson	1	.	.	1
Hon. D. W. Connolly	41	2	1	44
Second Geological Survey of Pennsylvania	78	8	.	86
Smithsonian Institution	21	8	.	29
American Philosophical Society, Philadelphia	.	16	.	16
M. S. Cann	3	.	.	3
Hon. J. A. Scranton	33	7	.	40
J. A. Price	2	2	.	4
Wilkes-Barre *Record*	.	2	.	2
Scranton *Free Press*	7	2	.	9
Hon. C. E. Wright	1	.	.	1
Scranton Board of Trade	.	3	.	3
Presbyterian Historical Society	.	1	.	1
Mrs. Maria Hickok	26	64	1	91
William A. Wilcox	1	.	.	1
Scranton *Republican*	72	12	.	84
I. H. Burns	.	5	1	6
Young Men's Christian Association, Scranton	2	1	.	3
Co. D, Scranton City Guard	.	1	.	1
Oneida Historical Society, Utica, N. Y.	.	2	.	2
Rev. S. C. Logan, D. D.	16	.	.	16
R. N. Davis	.	1	.	1
Rev. T. M. Cann, A. M.	.	4	.	4
Miss Emma Garrett	.	1	.	1
R. D. Lacoe	1	1	.	2
Academy of Natural Sciences, Philadelphia	.	1	.	1
Wyoming Hist. and Geol. Society, Wilkes-Barre	.	4	.	4
Portland Soc'y of Natural History, Portland, Me.	.	1	.	1
Academy of Sciences, Davenport, Iowa	.	1	.	1
Meriden Scientific Association, Meriden, Ct.	.	2	.	2
Brookville Soc. of Nat. Hist., Brookville, Ind	.	1	.	1
N. S. Davis	6	.	.	6
Penn'a State Board of Agriculture	2	.	.	2
Hon. L. A. Watres	2	.	.	2
H. W. Johns M'f'g Co.	.	1	.	1
E. C. Dimmick	1	.	.	1
J. C. Platt	6	.	.	6
F. B. Williams	1	.	.	1
R. W. Luce	3	.	.	3
(Purchased)	1	1	.	2
U. S. Commissioner of Patents	.	5	.	5
Clarence Keller	2	9	.	11
F. E. Loomis	33	2	.	35
R. D. Schimpff	.	4	.	4
A. W. Dickson	1	.	.	1
W. H. Hazard	1	.	.	1
Frederick Fuller	1	.	.	1
Total	365	175	3	543

Donations to the Museum for the Year are as follows:	Mineralogy, Paleontology, Geology.	Conchology, Ology and General Zoology.	Archæology, Ethnology and Historical Relics.	Total.
Miss Kate M. Winton	1	. .	. .	1
Charles LeR. Wheeler	7	58	. .	65
Dr. J. W. Gibbs	4	. .	. .	4
Seymour Galland	3	. .	. .	3
Mrs. U. G. Schoonmaker	. .	3	. .	3
J. F. Snyder	4	. .	. .	4
George Starkey	. .	13	. .	13
H. B. Clearwater	. .	15	. .	15
Charles Cannon	. .	. .	1	1
Henry C. Doud (loan)	. .	. .	1	1
H. W. Johns Manufacturing Co., N. Y.	22	. .	. .	22
W. H. Eastman	5	. .	. .	5
Miss Emma Garrett	. .	. .	6	6
H. G. Dunning	. .	1	. .	1
L. R. Reel	3	. .	3	6
Curtis W. Doud, Omaha, Neb.	23	. .	. .	23
J. A. Price	2	. .	4	6
Henry Blatter	1	. .	. .	1
Willie P. Kingsbury	. .	. .	3	3
D. N. Green	3	. .	4	7
Henry Frey	3	. .	. .	3
C. A. Whittemore, Grand Rapids, Mich.	24	. .	. .	24
Pennsylvania Salt Mfg. Co., Philadelphia	2	. .	. .	2
Samuel Newhouse, Ouray, Col.	12	. .	. .	12
Charles Purrington, Pequabuck, Conn.	47	. .	. .	47
S. W. Loper, Durham, Conn.	25	. .	. .	25
E. T. Shaw, Bonne Terre, Mo.	8	. .	. .	8
F. P. Graves, Bonne Terre, Mo.	2	. .	. .	2
John W. Loveland	1	1	. .	2
Leo E. R. Schimpff	1	. .	. .	1
N. S. Davis	. .	2	. .	2
Fred. Wilharm, Jr.	1	. .	. .	1
Miss Annie E. Chase	. .	. .	11	11
E. S. Moffat	2	. .	. .	2
Thomas Carson	8	. .	. .	8
——— James	1	. .	. .	1
R. D. Lacoe	7	. .	. .	7
Totals	222	93	33	348

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BY-LAWS.

ARTICLE I.—*Name.*

This association shall be known as the Lackawanna Institute of History and Science.

ARTICLE II.—*Objects.*

The objects of the Institute shall be the promotion and diffusion of general historic and scientific knowledge among its members, and in the community at large, and the establishment and maintenance of a library, a museum, and a historical record.

ARTICLE III.—*Membership.*

The Institute shall consist of members in four classes, to wit: Active, Life, Honorary, and Junior.

1. *Active Members.*—Only active *paying* members and life-members shall be entitled to vote or hold office in the society.

2. *Life-Members.*—Any active, honorary, or junior member shall be eligible to election to life-membership in the Institute upon the tender of a fee of not less than one hundred dollars, and when enrolled as such, the fee shall be covered into the Treasury of the Society. No annual dues shall be collected of life-members. They shall have all the rights and privileges of active members, and be subject to the same rules, and if suspended or expelled from the Institute they shall forfeit all claim founded on the payment of the life-membership fee.

3. *Honorary Members.*—These shall be elected as such, upon nomination of any active member, provided the

nomination is indorsed by the Board of Trustees. But this membership shall only be conferred in recognition of literary or scientific attainments and character.

4. *Junior Members.*—Boys under eighteen, or girls under sixteen years of age, may be proposed and elected as junior members of the Institute, but they shall not be required to pay initiation fees or annual dues, nor be allowed to vote. Junior members shall be encouraged and expected to collect specimens of natural history, and all other matters of interest for the library and museum of the Institute, and shall be entitled to receive instruction gratis from the Curator, and to enjoy the privileges of the Society's rooms, subject to the supervision of the Board of Trustees.

5. On reaching majority, any junior member may become an active member, without further action of the Institute, by the payment of the regular dues and signing the by-laws.

6. The membership in any of these classes shall not be determined by sex, but shall be open to males and females alike, except that active female members shall not be required to pay initiation or annual dues; and no active non-paying members shall be allowed to vote in the meetings of the Institute, but shall possess the right to vote in all committees upon which they may be appointed.

7. If any member shall not conform to the accepted order of the Institute, shall abuse any of its privileges or trusts, or neglect to pay his dues or fines for one year after they are due, his name may be stricken from the roll of members by a two-thirds vote, and such member shall forfeit all his rights and interests in the Institute from that time.

8. Any member may, at his own request, be honorably retired who presents his request in writing, provided he is in good standing, and has paid all dues or arrearages.

ARTICLE IV.—*Meetings.*

The meetings of the Institute shall all be held at the rooms of the Society when practicable, and always in the City of Scranton.

1. The annual meeting shall be held on the second Tuesday of February, at eight o'clock p. m., when all officers and Trustees shall be elected, and annual reports of the Board and permanent committees shall be presented.

2. Stated meetings shall be held monthly, bi-monthy, or quarterly—as the Society shall find most effective to the ends proposed—on the second Tuesday of the month, or of each quarter, beginning with the annual meeting.

3. If the stated meetings of the Institute are held quarterly, the Board of Trustees shall meet at least once between the stated meetings, at a stated hour, when any member having business with the Institute may present it to the Board.

4. In all other cases the Board shall meet on its own order and act under its own by-laws; these by-laws being subject to review by the Institute upon written complaint of any active member.

ARTICLE V.—*Election of Members.*

All nominations for membership shall be made by active members of the Institute, and may be made by any active member of the same. They shall be in writing, and each nomination shall be referred to the Board of Trustees, as an examining committee, who shall report on the same at the first subsequent meeting. If the report is favorable, the candidate shall be voted upon by ballot, and a two-thirds vote of the members present shall elect.

ARTICLE VI.—*Fees and Dues.*

All active male and voting members shall pay a fee of five dollars, upon notification of their election, and shall be enrolled when they pay the same. An annual fee of the same amount shall also be due from each such member (except life-members) on the 2d Tuesday of February of each year, which shall be increased to six if not paid before the end of six months. No further tax shall be levied on the active membership, unless by a nine-tenths vote of the members present.

ARTICLE VII.—*Officers.*

1. The officers of the Institute shall consist of twelve Trustees, which number may be changed in accordance with the provisions of the Act of Assembly; a President, two Vice-Presidents (first and second), a Treasurer, a Recording Secretary, and a Corresponding Secretary. The President and the two Vice-Presidents shall be chosen by the Institute from among the trustees elected.

2. These officers shall have such powers and privileges as the charter, the by-laws, and special acts of the Institute shall from time to time give them.

3. All these offices shall be honorary, and their duties be fulfilled without salary, except that of the Treasurer.

ARTICLE VIII.—*Election of Officers.*

All the officers provided for by the charter and by these by-laws shall be chosen annually by ballot, on the second Tuesday of February, at the annual meeting. And no officer shall be elected without a vote of a majority of the members present and voting. *Provided*, 1. That the Institute shall have power at any regular meeting to fill vacancies; and 2. That, in case of a failure to elect at the annual meeting, the officers shall be continued in office until their successors are duly elected, which may be done at any subsequent meeting of which due published notice has been given.

ARTICLE IX.—*President.*

It shall be the duty of the President to preside at all meetings of the Institute, and of the Trustees, and to preserve order in all such meetings. He shall countersign all warrants for moneys authorized to be expended, either by the Institute or its Board of Trustees, before the Treasurer shall pay out the same.

ARTICLE X.—*Vice-Presidents.*

The Vice-Presidents shall be elected as First and Second, and in the absence or inability of the President, they shall preside and perform all the functions of the office of President, in their order.

ARTICLE XI.—*Treasurer.*

1. The Treasurer shall receive all money belonging to the Institute, keep an accurate and clear account of the same in the books of the Society, and shall pay out the same only upon the written warrant of the Recording Secretary, countersigned by the President or Acting President.

2. The Treasurer shall give bonds in such sum, and in such form, and with such sureties, as the Board of Trustees shall require, and receive such compensation as they shall deem just. He shall keep the books of his office open to the inspection of such committees as the Board may appoint. He shall render a full report annually of all moneys entrusted to him, and submit all accounts to the Auditors of the Society whenever required by the Institute, and shall pay over any balance in his hands at the expiration of his term of office, to his successor, who shall receipt for the same on the Treasurer's book.

3. The Treasurer shall report to the Institute the list of all delinquents at the end of six months after their fees are due.

ARTICLE XII.—*Recording Secretary.*

It shall be the duty of the Recording Secretary to keep the minutes of all meetings of the Institute, and of the Board of Trustees, and, when corrected and adopted, to record the same in the books provided for that purpose. He shall draw and sign the warrants for all moneys authorized to be paid out by the Treasurer, either by the Institute or its Board of Trustees, and such orders shall be recorded and countersigned by the President. He shall also be ex-officio chairman of the permanent committee on the Library and Scientific Record.

ARTICLE XIII.—*Corresponding Secretary.*

The Corresponding Secretary shall have charge of all correspondence of the Society, subject to order; and in the absence or inability of the Recording Secretary, he shall keep the minutes and report them to him. In the absence of both secretaries, a secretary pro tem. may be appointed. The Corresponding Secretary shall also be ex-officio the chairman of the Permanent Committee on Historical and Biographical Record.

ARTICLE XIV.—*Curator.*

1. The Board of Trustees, subject to the approval of the Institute, shall have authority to appoint a Curator, and fix his salary, who shall have charge, subject to their supervision, of the Rooms, Library, and Museum; shall classify all papers, books, specimens, and curiosities placed in the keeping of, or belonging to, the Institute. He shall also generally make and direct investigations in accordance with the designs of the Institute. His whole trust shall be under the supervision of the Board, and shall be executed so as to meet the best convenience of the majority of the active members, as well as forward the aims of the Institute.

2. The Curator shall present to the Institute an annual report, through the Board, upon the condition of the property and trusts committed to his care, with such suggestions for its improvement as his wisdom and experience may suggest.

ARTICLE XV.—*Assistant Curator.*

The Board shall also, subject to the approval of the Institute, have power to appoint and pay an Assistant Curator—either male or female—for such length of time, and for such exigency and service, as in their judgment may be deemed for the best interests of the Institute.

ARTICLE XVI.—*Permanent Committees.*

These shall each consist of three members, chosen annually by the Society, as follows: The President shall nominate the Chairman, the Chairman the second, and the second the third member, and a vote shall be taken on each nomination separately. Of such committees as any officer is ex-officio chairman, that officer shall nominate the second, and he the third member. The permanent committee may be increased in number or diminished by a majority vote from time to time, as use and wisdom may suggest. They are these:

1. *The Committee on Library and Scientific Record.*—The Recording Secretary shall be ex-officio Chairman of this com-

mittee. It shall be the duty of this committee to solicit books, papers, and specimens for the library and museum, to keep a record of the new discoveries of science, and to solicit papers and nominate lecturers on scientific subjects. This committee shall investigate and recommend or refuse to recommend all collections or works of general science, offered for purchase by the Society. They shall also have the right to be present and consult with the Board of Trustees on all matters connected with their work.

2. *The Committee on Historical and Biographical Record.*—The Corresponding Secretary shall be ex-officio Chairman of this committee. It shall be the duty of this committee to keep a record of remarkable events, to be preserved in the archives of the Institute. They shall solicit and obtain, as found practicable, relics, pictures, models, documents, family records, and traditions calculated to throw light upon the history of the City of Scranton, and of Lackawanna County and adjacent regions. They shall arrange and preserve these for reference in the library or museum. This committee shall also prepare biographical notices of deceased members of the Institute, and of remarkable men and women of the county, and shall present the same from time to time to the Institute. They shall also nominate lecturers on history and biography.

3. *The Committee on Printing and Permanent Filing of Books and Papers.*—To this committee shall be referred all papers offered to the Institute for publication, distribution, or permanent filing; and no action shall be taken upon such offer until they shall report on the same.

4. *The Committee on Finance.*—The Treasurer shall be ex-officio Chairman of this committee. It shall be its duty to watch over the finances of the Institute; to make and present estimates of the necessities of the treasury; to propose all assessments and taxes necessary to meet the liabilities of the Institute, and to suggest plans for enlargement or improvement of the rooms of the Society.

5. *The Auditing Committee.*—There shall be annually appointed a committee of three members who shall be the Auditors of the Association. This committee shall at least once a year audit the accounts of the Treasurer, and shall report on the

same. They shall also examine and certify all accounts of committees and officers, having at any time charge of the raising or expenditure of moneys for the Institute.

ARTICLE XVII.—*Standing Committees.*

The Standing Committees shall be appointed by the Board of Trustees, and reported to the Institute at the first meeting after their appointment. These Standing Committees shall be appointed on such subjects as the Board of Trustees feel that the interests of the Institute demand. Each of these committees shall keep a record of their conclusions, and report in the books provided for that purpose, and these books shall be kept in the library of the Institute, subject to the inspection of active members.

ARTICLE XVIII.—*Occasional Committees.*

These may be appointed by either the Institute or Board of Trustees, and shall always act on instruction. They can determine nothing, but simply investigate and report to the appointing body.

ARTICLE XIX.—*Expenditures.*

No expenditure of money shall be incurred except as expressly authorized by the Board of Trustees.

ARTICLE XX.—*Amendments.*

1. In order to amend these by-laws, notice must be given in writing, which shall clearly state the amendment proposed. Such notice shall be read at each meeting until the third thereafter, when action may be taken. No amendment shall be made except by a two-thirds vote of all the members present.

2. By-laws may be suspended at any regular meeting by a vote of two-thirds of the members present, except Articles 3, 6, 7, 8, 14, 19, and 20, which shall not be liable to suspension.

ARTICLE XXI.—*Conduct of Business.*

1. At all meetings the ranking presiding officer who may be present shall take the chair at the hour appointed, and preside through the meeting unless excused by the Society. Seven active voting members shall constitute a quorum to do any business of the Society, except such as involves the expenditure of money, when eleven members shall be necessary to constitute a quorum.

2. The order of business at all regular meetings shall be as follows:

1. The registry and report by the Secretary of a quorum present.

2. Minutes of last meeting read and engrossment approved.

3. Presentation of candidates for membership.

4. Action on such presentation, and election of members previously nominated.

5. Payment of dues to the Treasurer and report of Finance Committee.

6. Reports from Board of Trustees and from permanent and standing committees in their order.

7. Unfinished business.

8. New business.

9. Correspondence and communications; report of Corresponding Secretary.

10. Exhibition of specimens, or experiments, with reports or lectures from standing committees.

11. General conversation, or verbal statements.

12. Adjournment.

3. The rule of order generally adopted by deliberative bodies are to be observed in all meetings of the Institute.

4. Any officer or member of the Institute shall be deemed eligible to appointment on any committee of the same, and unless excused from service, all members of committees shall be liable to a fine of fifty cents for failure to perform the duties of their appointment.

AMENDMENTS.

(Adopted January, 1888.)

ARTICLE XXII.—*Indebtedness.*

No indebtedness shall be created by the Board of Trustees or by any of the officers of the Institute, to exceed altogether at any time the sum of one hundred dollars after making allowance for cash in the treasury.

ARTICLE XXIII.—*Trustees.*

The Board of Trustees shall after the expiration of the term of the trustees now in office consist, of seven members.

ARTICLE XXIV.—*Committees.*

All members of committees shall be appointed by the President except such as are members by virtue of their office. Such appointment shall be made by and with the advice and consent of the Board of Trustees, except where occasional or special committees are authorized by the Institute in general meeting, when such appointment shall be with the advice and consent of the Institute.

CHARTER.

BE IT KNOWN, that the subscribers, all of whom are citizens of the Commonwealth of Pennsylvania, having associated themselves together for the formation of a natural science and historical society, and being desirous of becoming incorporated agreeably to the provisions of "the corporation act of one thousand eight hundred and seventy-four," and the supplements thereto, do, in compliance with said act, set forth regarding the intended corporation, as follows:

I. The name of the corporation is THE LACKAWANNA INSTITUTE OF HISTORY AND SCIENCE.

II. The purpose for which the corporation is formed is the promotion of scientific and historical research, with particular reference to the locality of incorporation. This purpose includes the formation and maintenance of a library and museum treating of and illustrating the different branches of natural science and history.

III. The place where the business of the society or corporation is to be transacted is the City of Scranton, Lackawanna County, Pennsylvania.

IV. The corporation is to exist perpetually.

V. The names and residences of the members are as follows: WILLIAM CONNELL, J. A. PRICE, ALEXANDER W. DICKSON, BENJAMIN H. THROOP, and ALFRED HAND, all of the City of Scranton.

Section 2. The corporation shall have power to admit from time to time other persons to membership, in such manner and upon such requirements as shall be prescribed in the by-laws.

Section 3. And the corporation shall have power to exclude, expel, or suspend members for just and legal causes, in such manner as shall be provided in the by-laws.

VI. The number of Trustees is to be five, and the names and residence of those who are chosen as Trustees for the first year are as follows: WILLIAM CONNELL, J. A. PRICE, ALEXANDER W. DICKSON, BENJAMIN H. THROOP, and ALFRED HAND, all of the City of Scranton.

VII. The corporation shall have no capital stock.

VIII. The corporation shall have power to hold, purchase, and transfer such personal property as the purposes of the corporation require, not exceeding five hundred thousand dollars in value, and real estate not to exceed the limit prescribed by law.

IX. The by-laws for the regulation of the affairs of the corporation shall be adopted at a general meeting of the members, called for that purpose. They may be amended by a two-thirds vote at any subsequent like meeting, notice of the proposed amendment having been given at the three regular meetings next prior thereto.

X. The corporation shall have, generally, the powers conferred by the said "the corporation act of one thousand eight hundred and seventy-four," and its supplements.

In testimony whereof, we have subscribed our names to this proposed charter, the eighteenth day of January, Anno Domini one thousand eight hundred and eighty-six.

B. H. THROOP,
A. W. DICKSON,
J. A. PRICE,
WM. CONNELL,
ALFRED HAND.

Commonwealth of Pennsylvania,
Lackawanna County, } *ss.:*

Before me, ELIEZER D. JENKINS, Recorder of Deeds in and for the county aforesaid, personally appeared B. H. THROOP, A. W. DICKSON, and J. A. PRICE, three of the subscribers to the above and foregoing certificate of incorporation, known to me to be citizens of the said Commonwealth, and in due form of law severally acknowledged the same to be their act and deed.

Witness my hand and official seal this 26th day of February, A. D. 1886.

ELIEZER D. JENKINS,
[SEAL.] *Recorder.*

The within certificate of incorporation, duly certified, having been presented to me, a law judge of the County of Lackawanna, accompanied by proof of the publication of the notice of such application, as required by law, and I having perused and examined said instrument and having found the same to be in proper form, and within the purposes named in the first class specified in the second section of the "corporation act of one thousand eight hundred and seventy-four," and within the said act as amended by the Act of 17th April, 1876, and the same appearing lawful and not injurious to the community, I do, on this twenty-seventh day of February, A. D. 1886, in compliance with the said first-mentioned act, hereby endorse thereon these facts, and do order and decree that the within charter is approved, and that upon the recording of the said charter and this order, the subscribers thereto and their associates shall be a corporation for the purposes and upon the terms therein stated.

R. W. ARCHBALD,
Addl. Law Judge.

Lackawanna County, ss.:

Recorded in the Office for Recording Deeds, &c., in and for said County, in Charter Book No. 2, page 30, &c.

Witness my hand and seal of office this 4th day of March, Anno Domini, 1886.

E. D. JENKINS,
[SEAL.] *Recorder.*